PLASTICS

A Periodical Devoted to the Manufacture and Use of Composition Products

MAY, 1927

Molded Products

See Page 233

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PLASTICS
& MOLDED PRODUCTS

A periodical devoted to the manufacture and use of plastic and composition products

Vol. 3 May, 1927 No. 5

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PLASTICS

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and use of plastic and composition products

Vol. 3 MAY, 1927 No. 5

The Manufacture of Casein Solids

IV. Hydraulic Press Equipment required for production of plates and blocks

By Heinrich Prehn

Consulting Engineer, German Correspondent of Plastics

IN the previous installments of this detailed and exhaustive study of the commercial manufacture of the casein solids, the grinding and mixing of the casein was taken up in the January issue of Plastics; and the extrusion of rods and tubes in the March issue; the pressing of plates from the rods having been outlined in the April issue.

The present article goes into minute details regarding the type of hydraulic presses and other appurtenances required for carrying out the more important stages of casein solid manufacture.

In order to make the further manufacturing operations in the production of casein solids more easily understandable, and to give a comprehensive idea of the hydraulic equipment required for large-scale operation, the hydraulic presses and auxiliary equipment will now be taken up. The hydraulic presses used in making casein solids are divided into several distinct groups of types, namely:

Hydraulic platen presses, usually multi-platen,

Hydraulic pumps,

High and low pressure hydraulic accumulators.

The hydraulic platen presses (See Fig. 9) are again subdivided into:

Hot presses,
Cold presses,
Straightening presses.

These presses are employed for the preparation and the straightening of the finished (indurated and dried) casein solids plates. They differ but little from each other in general construction, the only points of dissimilarity being in the size and style depending upon the requirements of individual plants. A small plant may easily get along with but one of the multi-platen presses, this being preferably so arranged that all of the various operations can be carried out in it. That is to say it is arranged for cooling as well as heating and is capable of exerting the maximum hydraulic pressure that may be required for any of the operations of manufacture.

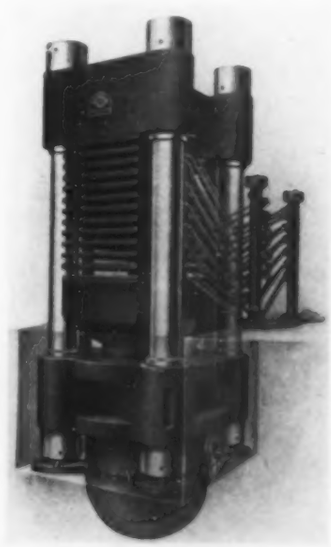


Fig. 9. Multi-platen hydraulic press used in making casein solids plates.

Heating and Cooling Presses

It is much more economical, however, to employ at least two of these machines, one of which is always working in the cold, and the other as a hot-press, as this not only saves a lot of otherwise wasted heat, but also economizes on the use of cooling-water, not to speak of the additional saving in time. There is no danger of affecting the quality of the casein solids manufactured by such a procedure, provided that the presses are of the proper type for the purpose and are correctly constructed, serviced and operated.

The dimensions of the presses most in use in the casein solids

industry, on the basis of the normal sheet of 500 by 400 millimeters size are as follows:

	Warm presses	Cold presses	Straightening presses
Size of plates made	650x650 mm.	650x650	550x550
Number of plates	6 to 12	6 to 12	10 to 20
Thickness of platens	about 50 mm.	40 mm.	35 mm.
Space between platens	from 40	to 75 mm.	
Working pressure of water used	abt. 600,000 kg.	100 atmos.	50 atmos.
Total press pressure	abt. 375 atmos.	100,000 kg.	100,000 kg.
Specific highest pressure applied upon the plates when using full surface, per square centimeter plate surface:	abt. 120 to 140 kg.	50-60 kg.	35 kg.

Both the heating as well as the cooling plates of these hydraulic presses must be highly polished and must be made of the best grades of open-hearth steel, of a type which does not warp when subjected to sudden changes in temperature. The channels through which the heating and cooling fluids pass should be drilled into the full bore of the plates and should be arranged in serpentine fashion so that there is an absolute assurance of even heating or cooling over the entire plate area. It is very advisable to have the heating and cooling channels so arranged that they are provided at the turns with plugs which allow of them being readily cleaned out in case of accidental stoppage by foreign matter getting into the same. The heating and cooling plates or platens are in turn supported by carrier plates which prevent the lateral displacement of the plates during the opening and closing of the presses.

Press Construction

The presses are provided with but one pressure-applying cylinder. The cylinder and heads of the presses are made from open-hearth steel; the columns are of forged steel, turned down smooth and usually polished as well. The plunger is made of a special steel cast under pressure and is also accurately machined. The pressure-platen is usually made of good cast iron and is guided by columns. The presses must be built with a considerable factor of safety to allow them to stand any accidental over-load.

The inlets and outlets for the water or steam used for heating are connected with the steam and water supply by means of swing-joints (such as for example those known in Europe as the "Siempelkamp" joint), and which, if all rusting and corrosion is to be avoided should be made from red brass. The older types of high-pressure metallic hose, or even rubber tubing, have practically been completely superseded, as these very often are prone to break or become leaky.

If the unions or other means of attachment are provided with pressed leather or packing-material gaskets, they should be so arranged that the packing can be easily replaced in not over one-half hour, and without removing the plates or plungers.

Hydraulic Pumps

The necessary hydraulic pumps for providing the required hydraulic pressure are usually vertical triple pumps such as shown in illustration No. 10. For a plant intended for the average daily production of from 400 to 600 lbs. of casein solids plates, one such hydraulic pump will be sufficient. Larger plants should be equipped with both low and high pressure hydraulic pumps. Not much can be said regarding the relative efficiency of these pumps as this depends entirely upon the load which they are expected to take care of. The hydraulic plant, when using but a single pressure-pump, must be equipped with at least two independent means for releasing the accumulator.

In general, the hydraulic pumps consist of a strong cast-iron frame, which is mounted on a common base with the wrought-iron water-box. The frame has two bearings, provided with ring-lubricators, and which carry the crank-shaft, which has two right-angled bends in it, to accommodate the connecting-rods of the pump-plungers. The crankshaft, as well as the connecting-rods should be made each from a single piece of forged steel. The connecting rods have bronze bushings and are well lubricated. The cylinders are made of steel, and the piston-rings usually of bronze. The surfaces of the pistons are carefully machined, and provided with easily tightened stuffing-boxes. To insure longlived valves and valve seats it is best to choose such as are made of bronze, and to have them so arranged as to be replaceable. The accumulator device is so arranged that on reaching the maximum pressure, the supply of water pressure is automatically stopped, and again thrown into operation when the pressure in the hydraulic accumulator drops. The desired point of this operation is controllable.

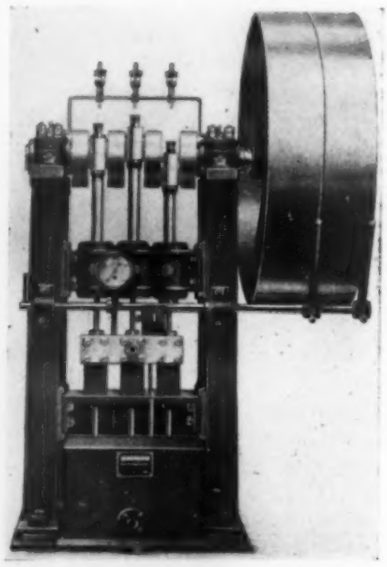


Fig. 10. Typical triple-plunger hydraulic pump for supplying water under pressure for operating hydraulic presses.

The pressure is kept uniform by employing what is known as hydraulic accumulators, of which there are several types.

One common type of high-pressure accumulator (see illustration No. 11) consists in

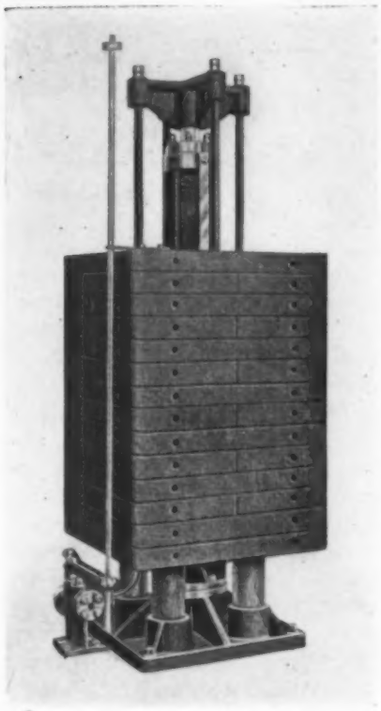


Fig. 11. High-pressure hydraulic accumulator.

essence of a wrought iron cylinder, a base, the plunger with its carrying devices and the weight, or, preferably, weight-container. The base of the accumulator consists of cast iron, the plunger of hardened steel. The plunger is kept tight by adjustable stuffing box. The connection between the carrier and the ballast of weight is made of wrought rods.

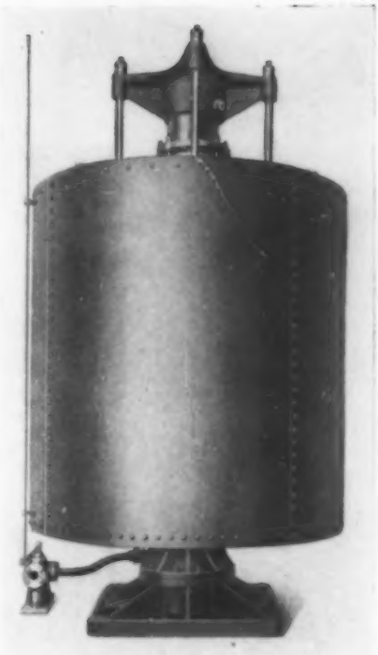
The weight on a high-pressure accumulator usually amounts to 15,000 kilograms (33,000 lbs.). This provides water under a pressure of about 375 atmospheres (5,500 lbs. per square inch).

Low Pressure Accumulators

In order to make it possible to close the presses more rapidly, it is often a very good plan to install also a low-pressure accumulator (See Fig. 12). This gives up its pressure, which is renewed either during the application of the high pressure or during the rest periods in the cycle of operations, and serves to supply relatively large amounts of water to the presses in a short time so that they will close much more rapidly. The low-pressure accumulator usually supplies water at about 100 atmospheres pressure, carrying a weight of about 31,000 kilograms, (68,400 lbs.). The general construction is about the same as that of the high-pressure accumulator, except that the larger load or weight on this accumulator renders its operation more stable.

The weights on the accumulator must be symmetrically arranged as any uneven loading will put a strain on the cylinder. To prevent a swaying or rocking movement of the weight-holder,this is guided by upright guide-channels.

(In our next article the operation of the presses and their appurtenances will be taken up in detail).



The illustration (Fig. 12) shows a typical low-pressure hydraulic accumulator employed to close presses rapidly.

Molding Mica Insulation

Glycerol-phthalic acid resins used as binders for molding motor commutators

CONSIDERABLE work has been done in the past five years on the development of molded mica insulation, and especially the General Electric Company has been responsible for much of the technical development along these lines.

A few years ago this company exhibited samples of its glycerine and phthalic acid synthetic resin, called "Glyptal," made under the Callahan patents 1,108,329 and 1,108,330. This type of synthetic resin appears to have properties which render it particularly applicable to the making of built up or "pasted" mica insulation, specifically for commutators of motors and generators of electricity.

Two patents issued to the General Electric Company on March 1st, 1927, No, 1.619,692 on an application originally filed September 13th, 1922, by Lawrence E. Barringer and Charles F. Peterson, and the other No. 1,619,758, filed on April 14th, 1925, by Peterson alone. Both patents relate to the problems of making molded mica insulation, and contain enough pertinent information to make interesting reading.

Quoting from patent 1,619,-692, the inventors state, among other matters, that:

Superior to Shellac

"The so-called *pasted mica* consisting of plates or flakes of mica bonded together, has for many years been made by the use of a binder of natural gum, such as shellac or copal. Attempts have been made from time to time to use other binders but none have proved as suitable as shellac. However, shellac softens at comparatively low temperature (about 65° to 70° C.) and decomposes as the temperature increases, decomposition setting in rapidly between 175 and 200° C., hence certain disadvantages accompany its use.

In assembly operations of

(*Continued on page 222*)

A Lost Art in the Field of Plastics

Papier Mache was at one time in great favor, and recent inventions point to a revival.

By Dr. Otto Neustatter

(*Condensed from the Kunststoffe, 1927, 17, 64*)

AT the annual "Paper Show" in Dresden, Germany, an attempt is being made to revive an old venerable art closely allied to the modern plastics, and which, about two centuries ago was very flourishing and produced many very fine art objects. The author has reference to what is usually called "Papier Maché", which consists essentially of formed or molded comminuted paper or paper-pulp, which is subsequently enamelled, lacquered, or in other ways, decorated.

Invented in 1740

The invention of Papier Maché is ascribed to a Frenchman by the name of Martin about the year 1740, in Paris. However, the description of Martin's process by de la Lande makes it somewhat doubtful if a real molding process was used, as in the description, the statement that sheets of paper were superimposed occurs. Later developments were true shaping and molding processes applied to pulped paper, but the term "Papier Maché" undoubtedly dates from the time of Martin.

We next hear of the product through Frederick the Great who became the patron of a lacquer artist by the name of Chevalier, who founded a papier-maché factory at Berlin. This was later continued by Stobwasser. This art received a further impetus from the work of Henry Clay, in England. Clay was an employee of the well-known Baskerville of Birmingham, England, and obtained a patent in that country on a product termed "Paper Ware" in 1772. This however also mentioned the superimposition of sheets of paper as the foundation for the molded objects. The products were usually highly ornamented by lacquering, gilding, bronzing and inlaying and were made in close imitation of mother-of-pearl, bronzes and the like. The plant at one time employed as many as 150 workmen and its fame spread throughout the world.

The forthcoming Paper Show at Dresden will be the scene of an attempt to get together a collection of antique papier mache work. As this art is a forerunner of plastic materials as we now know them, considerable interest should be accorded to the early examples of molded cellulose objects.

Early Examples

Dr. George Dickinson has recently published a very meritorious work on this venerable plastic industry, which, over 100 years ago, produced most excellent articles such as panels, serving trays, parts of furniture, boxes, ink-wells and desk-sets, vases, placques, screens, plastic objects and even violins. It is rather surprising in view of all this that such an industry should practically disappear.

Other European countries, such as Germany, France, Italy and Holland did practically nothing in this field, and according to C. J. Woodward, who was familiar with the papier-maché art in his youth, there are not even remnants of Martin's handicraft in any of the Paris museums. The same is true of Germany, and very little can be ascertained of the final fate of the factory founded by Frederick the Great.

The somewhat perishable nature of the material, or at least, the comparatively low value placed on the articles by collectors, is probably responsible for the dearth of authentic articles from the hands of these early workers. It is quite possible that the papier maché art goes back even to the 16th or 15th century, especially in Germany, where relief or bas-relief work was made from pressed pulped paper. The art is probably related to what the Italians term 'carta pesta.'

Modern development, especially the invention of thermo-plastic cellulose compounds, superseded papier-maché, and it is rather deplorable that an art which for several centuries produced models, geographic globes, imitations of porcelain and works of art, should no longer be represented even by specimens of what had been done.

The forthcoming exposition in the summer of 1927 at Dresden, it is hoped, will be productive of many articles which have reposed in private hands, and the cooperation of collectors and art-lovers is solicited.

Modern Art

It appears, however, that a modified form of papier maché is again engaging the attention of modern American inventors. In fact, only last February Mr. Robert Beardsley, of Chicago, was granted a patent (U. S. P. 1,618,263) for a modified form of papier maché for making many molded objects, both ornamental and useful.

In working his process, Beardsley says that he takes, by

preference, comparatively small pieces of paper, not over 5 inches in diameter, and torn either into irregular shapes or die-cut to definite outline, and assembles them in a mold such as is shown in Fig. 1. The paper is held to-

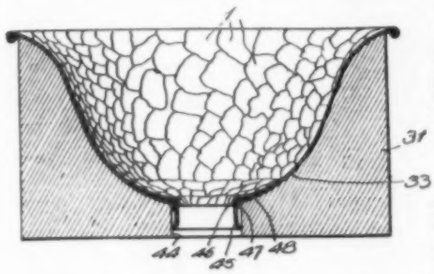


Fig. 1. Making a papier mache lamp shade.

gether by means of a common adhesive, such as library paste or dextrin, and the mold is oiled so as to prevent the material from sticking. Heat may be applied to hasten the drying and sticking together of the paper pieces.

Oiling For Transparent Effects

After the article has been shaped, it is immersed in hot oil, followed by a bath in cold oil, and finally in either turpentine or benzol. The paper thus becomes partly transparent or translucent and effects similar

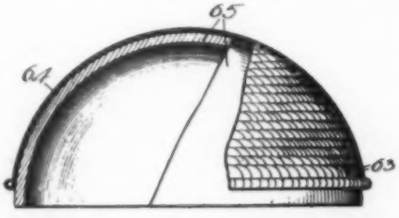


Fig. 2. Type of mold used.

to parchment are obtained. However, the material on account of its thickness is much stronger, and more ornamental than plain parchment.

Any color effect desired can be produced, and the objects may cover a wide latitude of application, such as bowls, lampshades, radio loudspeaker horns, vases, etc. An ornamental lamp shade in the mold, and a top view of a similar article, made from irregularly torn paper, are shown in Figs. 1 and 3.

The oil used is linseed oil, and the temperature between 240 and 400°F. The claims are fairly broad, which, in view of the relative antiquity of the art of assembling pieces of paper to make papier maché articles is somewhat surprising, but then it is very doubtful if any printed descriptions of the details of manufacture of the historical papier maché articles are extant or within reach of the average library.

Although Beardsley does not say so, it is quite possible that some form of hardenable resin might be used to agglomerate the paper pieces, in analogy to the making of laminated phenol-resin articles.

(It is quite evident that paper pulp can be rendered available for the making of certain types of molded objects especially such as lend themselves to subsequent impregnation with hardening agents.

The Japanese, for example, have produced some magnificent lacquer ware, which although usually on wood, can be fairly duplicated on compressed pulp. —Ed.)

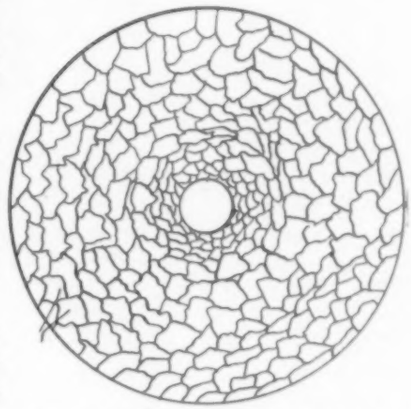


Fig. 3. Top view of lamp shade of pressed paper.

"Wood Gum" from Paper Process may prove cheap Plastics' Binder

AN invention of considerable importance is that of Lester C. Conner, of Malden, Mass., who has found a method of not only isolating what he calls a "Wood gum" from the waste-liquor resulting from the digestion of wood in the soda process and sulfate process of paper manufacture, but also of employing this gum in conjunction with glue or shellac in making molding powders and plastics.

Hardened With Formaldehyde

Another discovery was that formaldehyde would act upon the gum and harden it, and finally that phenol, cresol or similar phenols and also other aldehydes as furfural could be combined with the wood gum to produce commercially useable molding compositions, or as the inventor calls them "co-condensation products."

His patent, No. 1,614,025, Jan. 11, 1927, goes into minute detail as to the manufacturing methods, and gives instructions for combining the wood gum with both glue and shellac. In the first case hexamethylenetretramine is introduced into the mixture of gum and glue and the heat of the mold will cause a liberation of formaldehyde which not only hardens the glue but also the wood gum.

Used With Phenol

For examples of the use of phenols, Conner states that a moldable product results by combining wood gum with cresylic acid, or simply adding the cresylic acid to the "Black liquor" and then adding acetaldehyde. A vigorous reaction occurs with spontaneous heat. When this is over the product is neutralized with acid and a viscous mass in the nature of a condensation product separates, which being washed and dried can be ground up into an easily fusible dark-brown powder. This can be softened in a mold, under heat and pressure, from which state it solidifies into a molded article which is not easily fusible if at all. Fillers such as wood flour, etc., can also be added.

Colasta---How Systematic Research Gave Industry a New Plastic

Based on the reactions of sulfonated oils and formaldehyde, a radically different type of molding material was evolved

By Ralph W. Wales
of the Colasta Company

THE readers of *Plastics* are undoubtedly interested in the rapid development of the thermoplastic industry in its relation to their particular phase of that most interesting and diversified line of business. There is a great deal of unrest, nervous tension, unwarranted price slashing and whatnot as a result of the expiration of certain patents and the immediate assumption by some that it is a simple matter to produce a satisfactory material to take the place of those developed by years of research.

If we will look into the past and consider the labors of Adolph Von Bayer as early as 1873 and those of Kleeberg shortly afterwards, and so on through the many long years of research and endeavor by the pioneers in this interesting field, we will appreciate the efforts of those who have been successful in placing on the market a commercial heat-resisting compound for the millions of parts fabricated therefrom today.

It is the opinion of the writer that this is an opportune time to outline briefly the history of one of the old line companies now carrying on its activities in Hoosick Falls N. Y., under the name of The Colasta Co., Inc., whose chief product is a thermoplastic compound of the heat-resisting type.

Early Developments

In the year 1912, the writer was introduced to Wm. W. Carter, chemical and electrical engineer M. I. T. '93-'94, and member Am. Chem. Society, a man of great skill and learning and an inventor of note, who was engaged in working out a synthetic gum or rubber substitute for use in the plastic field. It was the desire of Mr. Carter to associate with himself some one capable of developing the practical side of this line of endeavor, as he realized that the theoretical work would command his untiring energy. It was the good fortune of the writer to be chosen for this important work and I am very grateful to Mr. Carter for that privilege.

RALPH W. WALES

Fifteen years of constant association with the inventor and the development of Colasta, have given the writer a clear insight into the problems which had to be solved before the material gained its merited success.

This invention started from the following fundamental chemical reaction. When an oil of the drying or varnish group such as linseed or China wood oil, is treated with concentrated sulphuric acid, a hard rubber-like substance is formed, and any non-drying impurities of the oil remain unaltered or are sulphonated in a manner similar to the production of Turkey red oil from castor oil. This rubber-like substance is very resistant to heat and ordinary chemicals and is insoluble in ordinary solvents. Hence it seemed to be suited for varnish, rubber substitutes, and insulation purposes. The reaction in its original form was not new, in fact it is the basis of a qualitative test for drying oils. The reaction is impractical as regards control, and removal of the acid excess and impurities is difficult.

Continued Research

Search was made for a substance that would produce similar results but in a slower and more easily controlled manner. It was found that a sulphonate of the cyclic series reacted smoothly and slowly with a much better result.

It was known that vulcanized rubber was considered a solid solution of three rubber-like bodies, each with different characteristics namely, (1) rubber combined with sulphur (2) rubber uncombined, soft but dry, not sticky, and (3) a liquid-like body that dissolves in the other two to maintain elasticity.

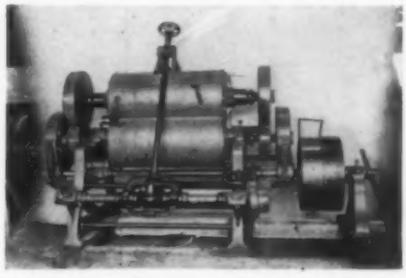
Similar considerations relative to the rubber-like product produced from a gelatine glue, glutens and casein, and albumens showed the necessity of a dispersed liquid throughout the colloidal solids. For example; take the printer's roll of glue,

water and glycerine. Glue by itself dries to a hard substance, but with proper percentage of water and glycerine remains rubber-like. Casein even when set with formaldehyde in the manner used for the production of artificial ivory articles, remains rubbery, provided the water does not dry out. This is easily prevented by use of a hygroscopic salt such as calcium chloride.

With the considerations in the last two paragraphs in mind, search was made for a liquid capable of dispersion throughout the colloid formed by the interaction of this sulphonate and the oil.

Difficulties Overcome

Various liquids were found to be available but the cyclic hydrosols were most useful. By varying the percentage of the dispersing liquid, all consistencies of colloidal dispersion were produced, from viscous liquids to dry crumbly elastic gels, all of which seemed to have industrial applications. However, one bad fault persistently appeared. Owing to the peculiarity of almost all organic chemical reactions of reaching an equilibrium before the quantitative completion of the reaction, there was always some free oil and sulphonate. The removal of these from the colloidal mass presented grave practical difficulties. The free sulphonate also had the following feature that owing to its hygroscopic nature it absorbed



Mixing machinery used in producing Colasta.

moisture from the air, gradually freeing more and more acid from the sulphonate and eventually destroying the rubber-like compound, converting it into a viscous, acid mass with the consistency of molasses.

Owing to the difficulty of removing the uncombined sulphonate the idea of neutralization or of combining with bases to produce an inert non-hygroscopic substance naturally suggested itself. Preliminary attempts to accomplish this showed that such neutralizing materials inhibited the fundamental reaction since all the chemicals had to be added at once.

After much experimentation the following method seemed to be practical. The neutralizing material, finely ground and free from water, was encased in an envelope of material that was not readily removed by the oil or sulphonate or dispersing agent, but capable of being eventually penetrated by the sulphonate in its uncombined state; whereby neutralization took place after the main reaction was accomplished.

Encasing materials suitable were found to be resins such as rosin, Manilla gum, shellac; rubbers as ballata, chicle, pontiac, gutta; cellulose nitrates, actetates and formates; also ground dried cellulose alkaline thiocarbonate, this containing both neutralizing material and its protective coating.

Vulcanizing

The neutralizing material was almost any alkaline salt whose acid was displaceable by sulphuric acid, the ones used were calcium carbonate, anhydrous borate and silicate of soda, aluminum powder, and amines as hexamethylenetetramine.

With the last mentioned neutralizing material, formaldehyde was released and this vulcanized the mass to a hard compound. The effect of hexamethylenetetramine opened up a new fields of work, as prior to this, attempts to vulcanize the rubber-like compound with sulphur and the golden antimony sulphide had been unsuccessful, although the drying oils combine with sulphur at a high heat.

Another effect of the hexamethylenetetramine was to improve the nerve or stretch

(*Continued on page 220*)

Representing two views of the Colasta Company's plant at Hoosick Falls, New York. On the left, the original factory; on the right, additional accommodation necessitated by the Company's progress.

Remarkable Rise of the Button Industry

First used purely as ornaments, the manufacture of buttons from its inception less than a century ago, has reached great commercial importance

By Dipl. Ing. Fr. P. Pondorf

BUTTONS date back almost to the beginning of history, and archeological investigations have shown that they were known to the ancients.

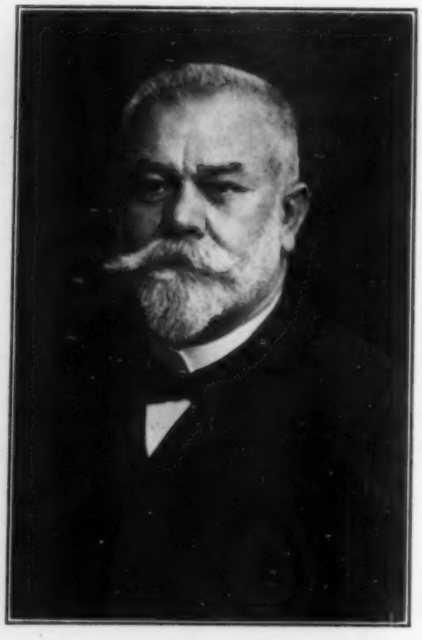
Originally buttons were not employed as means for fastening clothing, but were worn purely as ornaments, and usually as a mark of distinction.

The first buttons actually used as a means for fastening were made of bunches of either leather or fabrics. We next find buttons made of the teeth of animals and from pieces of bone, then wooden buttons, and finally as man began to work in metals, buttons made of bronze and other combinations of metals.

During the Middle Ages the button industry as such had its origin, especially in Europe and in the parts that are now Germany; the industry being in the hands of definite guilds, as was the case with so many articles of manufacure in the past. The materials used in these early days consisted mainly of metal, silk and fabrics, and it was not until the dawn of the 19th century that other raw materials began to be employed.

Mother-of-Pearl

The first different raw material which was manufactured into buttons was mother-of-pearl. This industry found its way into Europe from the Orient, soon prospered mightily, although all the work was done by hand and on foot-operated lathes. The seat of this industry was in France and Austria, and in 1840 it was taken up on a large scale in certain districts of Germany.



HERR KURT SYLBE

The venerable founder of the firm that supplies most of the world's button machinery.

The manufacture of buttons from horn was first attempted in the early years of the 19th Century, but no real success was attained at that time.

Ivory Nut

The real advance of button-making to an industry of first rank came with the introduction of ivory nut or vegetable ivory. How this came about is very interesting, as it points a distinct moral in showing that what at one time was considered a worthless product became the raw material of an immense industry.

Ships returning to Germany from South American ports were wont to carry a load of ivory nuts as ballast, and these nuts were then thrown away, or burned up as fuel. An importer of tropical wood, living in Berlin, became interested in these ivory nuts and made the first experiments on their utilization. The first ivory nut buttons were made at his instigation during the year 1859. Progress however was very slow, and it was not until H. and V. Donath became acquainted with the ivory nut button manufacture in Berlin that any real industry became possible. The Donaths founded the present great button industry in the German city of Schmolln, which, can safely be stated is the "Button Capital" of Germany, if not of the world. The entire ivory nut button industry had its origin in that city.

Spread of the Industry

The success of ivory nut buttons led to the establishment of other centers of the industry, mainly in Bohemia, Italy, and France in Europe, and in the United States of America. When it is remembered that even in 1865 only a few gross of ivory nut buttons were made each day, and that just before the war not less than 100,000 gross of ivory nut buttons were turned out weekly at Schmolln alone, the remarkable growth of this industry becomes vividly apparent.

For example of the 40 million pounds of ivory nuts exported from South America in 1900, 22 million pounds were imported into Germany, thus showing the extent of the industry even 27 years ago. From Schmolln, where there are at present 15 large ivory nut button concerns, the button industry spread into

(*Continued on page 232*)

Blowing Pyroxylin Articles

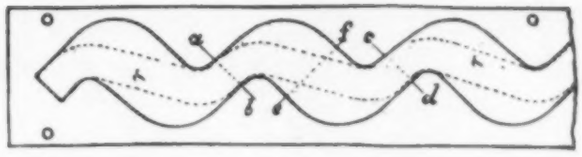


Fig. 1.

Plastic flow of cellulose nitrate plastics makes possible production methods unlike those employed with other types of material

By A. *Bahls*

From Kunststoffe, 1926, 16, 165

IN the March, 1927 issue of PLASTICS the drawing of pyroxylin plastic sheets was described, and reference made to the shaping of this material by blowing. The present article gives further details as to the methods employed, especially when making thin-walled, hollowed articles from the pyroxylin plastics. As a great many objects lend themselves to this type of fabricating technique the article should prove of especial interest to those who contemplate the production of pyroxylin plastic specialties, such as radio parts, dolls, toys and similar goods.

Hollow Objects

The underlying principle of the blowing of pyroxylin plastics is based upon the property of these substances of becoming soft and plastic upon heating, so that they can stretch and in other ways flow and adapt themselves with close registry to a retaining die or mold; and furthermore that pyroxylin plastic when thus heated is, in a way, capable of being welded, so that the production of one-piece hollow objects becomes possible.

The process is based upon the enlargement of a hollow space already existing in a pyroxylin plastic article by forcing in a hot fluid, either liquid or gaseous, at a temperature of at least 212° F, so that the hollow space will be widened and will stretch the pyroxylin and give it the desired shape. If, for example, a pyroxylin plastic tube, closed at one end, were subjected to heat and the simultaneous action of a fluid which is forced into its interior, the tube would attempt to become spherical, in much the same manner as a glass tube behaves when heated and subject to similar conditions. This stretching of the pyroxylin plastic can be carried to the limit of elasticity of the material.

This stretching is also accompanied by a shift in the mass of the material, in other words, the material is said to "flow." The amount of flow obtainable varies somewhat according to the amount of filler present and the color and type of the pyroxylin plastic being treated.

The pressure fluid employed for blowing the plastic, unless hot water is to be used, usually consists of steam and less often, of heated air. If steam is employed the first effect will be the heating of the plastic, which will soften it, followed by the desired flow of material. As this would entail a certain loss in time, it is customary when blowing pyroxylin plastics to preheat them by immersion in hot water. The temperature of the steam should be the natural temperature at the pressure at which it is employed, as super-heated steam would injure the material.

Two-part Molds

According to the temperature and pressure employed, the walls of the pyroxylin plastic tube being used will slowly or rapidly expand and the size of the tube will grow until the walls strike the die or mold. When properly done, very accurate shaping of pyroxylin plastics is possible, and the pressure is of very wide application. In order to make it possible to remove the blown objects from the mold, the latter is made in two or more parts. The heavier the walls of the pyroxylin plastic tube which is used, the greater must be the pressure applied. It is further essential, at least if accurate dimensions are to be retained, that the article be cooled before the same is taken from the molds.

The process is eminently suited for the mass production of pyroxylin articles, especially from comparatively narrow tubing. For example, telephone receivers can be made, the process being as follows:

Telephone Receivers

The mold used for making these receivers is about 40 inches long, and consists of two halves; the interior of the mold being provided with alternate enlargements and depressions, as can be seen from fig. 1. Both halves of the mold are identical, and the final shape of the article made is such that it is capable of being made in a double form, so that by cutting the objects in half, two complete pieces are produced. One half of the mold is also provided with pins which fit into holes in the other half, so that the two parts of the mold can not shift when the same is used.

When getting ready to mold the telephone receivers, for example, the two halves of the mold are heated by being placed upon a steam-table, whilst the pyroxylin plastic tubing is preheated in hot water in order to render it pliable. As the

(*Continued on page 227*)

An Early Patent on Glass-Clear Condensation Products

Seven years ago the Hanns John patent started the remarkably rapid development that has marked the progress in production of "organic glass"

By Carl Marx

THE advent of "Organic Glass," or "Pollopas," which is said to be a perfected urea-formaldehyde condensation product, has stirred the imagination of many writers who see in these products a perfect substitute for window-glass and what-not.

The fact that these condensation products are not only perfectly transparent, but even permit the passage of ultra-violet light, makes them very attractive to experimenters and others who are looking for a transparent product that does not possess the hardness and brittleness of glass.

Many other attempts have been made in the past seven years to produce urea-formaldehyde condensation products, and at various times inventors, and alleged inventors, have come forward to claim that they had finally solved the problem of manufacturing these products.

Thus far, the only really successful product has been that of Pollak and Ripper, the Austrian chemists, whose products were described in detail in *Plastics* last year. In this connection, it is very interesting to revert for a moment to what is probably the pioneer patent in this field, and one which would very likely be held to dominate most, if not all, of the urea-formaldehyde product processes irrespective as to whether they are in themselves patented or not.

This patent is that of Hanns John, applied for on October 25, 1919, and issued on October 19, 1920, as U. S. P. 1,355,834. The claims of this patent cover both the condensation products without any condensing agent, as well as those made with acidulated urea. As many of the readers of *Plastics* are undoubtedly deeply interested in the subject of glass-clear condensation products, and as we are often in receipt of requests for information on this subject, we are herewith reproducing, word for word, the Johns patent just as it issued.

A few typographic or clerical errors occur in the original patent, such as the curious substitution of the word 'corn' for horn both in the specifications and claims. John being "Magister of Pharmacy" of Prague, Czechoslovakia, probably wrote the original patent in German, and the translators took the German word "Horn" and called it by the French term "Corne," which in the course of various vicissitudes of typesetting becomes 'corn' in the patent.

The patent was assigned in 1922 to Dr. Hans Goldschmidt and G. Halphen, who in turn assigned it to Chemische Fabrik Ambra. Afterwards the patent rights were again assigned to Lauter and Fried. Fried transferred his half to Lauter, and both then assigned to the Lauter Corp. in 1925. Rohm & Haas of Philadelphia have acquired Lauter's interest on April 6, 1925 and as far as is now known at present control the patent.

The text follows:

Text of the Original Hanns John Patent.

"My invention relates to the manufacture of products obtained by condensation of an aliphatic aldehyde, preferably of formaldehyde, with carbamid (urea) or thiocarbamid or other carbamid derivatives, they being substantially equivalent.

The action of formic aldehyde on urea has been studied by various chemists. C. Goldschmidt, for instance, has caused formic aldehyde to act upon urea in the presence of potassium hydroxid. By this reaction he obtained an amorphous substance which readily disengaged formic aldehyde, and which he assumed to be dimethylolcarbamid.

All the products obtained up to the present by condensation of formic aldehyde with carbamid, were of no technical value or could not be used for industrial purposes, owing to their physical and chemical properties.

Now I have found that by carrying out the reaction between formic aldehyde and carbamid or its derivatives in a special manner, it is possible to produce different substances fit for a variety of technical applications.

By causing the condensation to take place either in the presence of alkali or other condensing mediums or making the starting substances to react upon each other at a low temperature during a more or less long time, the prior authors only obtained products such as the dimethylolcarbamid mentioned above, whereas by the process according to my invention substances are produced which were up to now unknown, and which are quite distinct from dimethylolcarbamid.

I have found that, in order to obtain condensation products fit for industrial applications, the reaction is to be carried out without addition of condensing agents and at a higher temperature. According to the quantities of formic aldehyde and of carbamid present, as well as according to the duration and height of heating applied, products of very different nature are obtained.

If the ingredients are caused to react only during a comparatively short period, the product of condensation is still soluble in water. This solution is highly adhesive and, when dried, leaves the condensation product in the shape of a perfectly colorless product which is transparent like glass and insoluble in all inert solvents.

In this stage therefore a glue is

produced which sticks in a cold state to all objects, of preference with smooth surfaces such as glass, metals, etc. The substance may also, besides other applications, be used for filling root-canals in dental surgery, or as a lacquer which can be directly laid on without addition of spirituous or such lige solvents. This colorless and brilliant lacquer may be mixed with any organic or mineral pigments. Furthermore, it may advantageously be utilized for impregnating materials or fabrics of any kind, especially for covering the supporting planes of flyingmachines, and such like.

If, from the beginning, the ingredients are brought together on such conditions that the process will be achieved only in a longer time than stated above, the resulant product of condensation will be still fluid in a heated state, but it will gelatinize when being cooled. In this way prepared, the product forms a colorless, transparent, tensile and elastic mass, insoluble in water as well as in alcoholic solvents, and which is acted upon only by acids or alkali liquors. This mass can be used as a substitute for india-rubber or such like.

The substance produced in the manner described, is moreover capable of being hardened. This hardening process is carried out most advantageously by heating the product up to say 80° C. According to the duration of the hardening process, the final products show different properties. The main advantage is that also the hardened product is colorless and transparent, as well as rather resistant to chemical agents, that it is readily to be worked and possesses a sufficient degree of elasticity.

When strongly heated, the substance is carbonized, but does not flare up.

The reagent substances may be used in various proportions as shown the following examples of carrying out the process under notice:

1. 5 parts of a commercial solution of (say 40 per cent.) formic aldehyde, and 1 part of carbamid are heated in a distilling vessel or still. When an adequate proportion of the liquid is distilled off, the gluelike mass as described above, is obtained.

2. 6 parts of a commercial solution of formic aldehyde and 1 part of carbamid are heated in a distilling vessel until nearly half the liquid has been distilled off. After cooling the gelatinous product described above, is obtained.

3. The substance obtained in accordance with example 2, is heated up to about 80° C. during such a period until it has attained the desired degree of hardness.

The carbamid mentioned in Examples, 1 and 2, can be replaced by thiocarbamid.

Furthermore, by heating other derivatives of carbamid with formic aldehyde in the manner described products of like or similar nature and properties are obtained.

4. 5 parts of a commercial (say 40 per cent.) solution of formic aldehyde and 1 part of acetylcarbamid are heated in the manner stated above. The resultant substance is colorless and liquid in a heated state, but sets

(*Continued on page 228*)

EDITORIAL · IMPRESSIONS

The New Section

MOLDED PRODUCTS is here This new section of PLASTICS is the result of a great deal of investigation by PLASTICS' augmented staff, and we take great pleasure in presenting it to our readers and to our advertisers.

Thousands of users of molded parts divided among forty different industries now have a publication devoted to their interests. Here they will find information regarding the different plastic materials. The advantage of each will be discussed, methods of buying will be suggested and all important developments will be anounced.

PLASTICS will continue its researches into new fields. It will determine those industries that should use molded parts and supply that information to the manufacturers. This service will be a benefit to all branches of the plastics industry, as a greater use for these products will naturally develop.

We are including MOLDED PRODUCTS within the covers of PLASTICS as we feel that this new section represents an integral part of the main industry.

The cooperation of readers and advertisers will be welcomed and suggestions and comments are invited.

Colorful Trends

THE demand for color continues to permeate many phases of our daily life. Already attire and automobiles have succumbed and now even so personal a concern as the appetite is not immune from its all-pervading influence. Says the Parker Pen Company—"....the trend in about everything they (the public) have to buy is going to colors....The bright colors predominate by a very big majority."

Plastic materials and more particularly the pyroxylin plastics and the casein solids have always been in the van of this trend towards brightness in color. So extensive is their range of color beauty that it becomes a comparatively simple matter to reproduce faithfully the most elegant of nature's galaxy of effects. Further, and this concerns the pyroxylin products more especially, they are so richly endowed with valuable properties, that the announcement of new uses is an almost daily occurrence. The pages of PLASTICS teem with such instances of the further application of these products at the same time so versatile and so beautiful.

At the Table

THAT stronghold of conservatism, the last stand of Toryism, the English dinner table has at last been invaded by plastic products.

As pointed out on another page of this issue, a long established British firm has placed on the market a line of tableware and fancy vases and dishes that rival crockery in many particulars, and in several ways surpass it.

These synthetic dishes have all the beauty and serviceable qualities of china-ware, and attained the unattainable in being practically unbreakable.

This new development should open up a new and unlimited market for molded products. If conservative England has taken up the new tableware, what will novelty-loving America do?

Here is something that must command the immediate attention of manufacturers able to forward this potential market.

PLASTICS

Fight On

THE tragic end of another of the proposed New York to Paris airplane flights, the second disaster to overtake the brave efforts of the modern pioneers of trans-Atlantic aviation, while deeply deplorable, nevertheless has one compensating feature. It vindicates once more that the progress of mankind can never be checked so long as there remain stout hearts and noble souls that have a higher regard for achievement and success than for very life itself.

This spirit of sacrifice and daring has always been characteristic of the pioneers in every field of human endeavor, and although some of their work has not been as spectacular as the recent long-distance flying attempts, to achieve success often required equal courage and persistence in the face of disappointment and almost insurmountable obstacles.

The early workers in the field of plastic materials took some tremendous risks, not only endangering their lives, but quite often their property as well. The writer well remembers the description given by the late John W. Hyatt at the time this inventor of Celluloid received the Perkin Medal, of the first attempt to mold pyroxylin plastics under heat. Mr. Hyatt had been severely warned by some experts on guncotton that his proposal was nothing short of madness, and that to heat guncotton under pressure, would inevitably lead to dire disaster. But, as Hyatt humorously put it, "I didn't know as much about it as the learned professors, so I invented Celluloid". Shortly after successful manufacture of Celluloid began, a fire completely wiped out the plant; but neither the elder Mr. Burroughs, nor Mr. Hyatt, was the least bit discouraged, and the splendid achievements of the pyroxylin

plastic art remain as a monument to the courage and tenacity of the inventor.

That is the true spirit of progress; and the same things are happening around us today. So if you feel that you are on the right track, don't let disappointments cause you to swerve from your goal. Even if you do not quite succeed, and have to leave the field for others to perfect what you have started, remember that every step in advance is just that much gained by humanity in general. And that seems to be the real purpose of life.

Cornstalk Cellulose

IN April *Plastics* (p. 188) reference was made to the recovery of cellulose from rice hulls. Now the cornstalk is to be called upon to yield up its celulose by a process developed by Dr. Bela Dorner, a Hungarian chemist, and sponsored by the Euromerican Cellulose Products Corporation.

It is claimed that the new cellulose can be produced at costs approximating one-third and one-fourth those for wood pulp and cotton linters, the raw material for pyroxylin, respectively. Present indications are that Des Moines, Iowa, will be a location of the industry.

College Point, American Catalin Corporation's Center.

ACCORDING to the *Long Island (N. Y.) Star* of Mar. 21, College Point, N. Y., will be the center of a new plastics industry. The American Catalin Corporation has acquired the extensive buildings formerly occupied by the Mynhepo Silk Mill there for this purpose and has established offices at 51 E. 42nd Street, New York City.

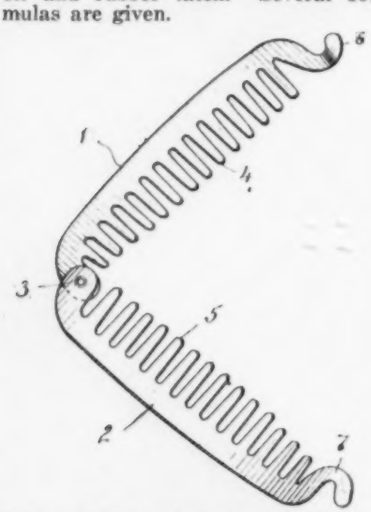
Viscoloid Company Plans Extension.

ANOTHER factory is to be built for the Du Pont Viscoloid Co. at Leominster, Mass. This will cost about $100,000 and will house the Paton Manufacturing Co., a department of the parent concern.

TECHNICAL ABSTRACTS
AND PATENT REVIEW

Protective or marking composition comprising cellulose-acetate or nitrate. Winthrop S. Lawrence, assignor to the Kaumagraph Co., U. S. P. 1,596,545; Aug. 17, 1926.

A material suitable for marking fabrics, or to act as a resist to prevent the dyeing of certain portions of a fabric in a dye-bath; or to act as a transfer to fabrics to decorate the latter, may consist of a number of different ingredients, but mainly of acid butyl tartrate, cellulose acetate, paracumarone resin, Venice turpentine, and, optionally also of 'gum argols", gutta-percha, chicle substitutes, sulfur, rubber, malic acid, stearic acid, phenols, etc.; or of cellulose nitrate, triphenyl phosphate, rapeseed oil and rubber latex. Several formulas are given.



Hair-waving comb-device. Herbert W. Johnson, U. S. P. 1,596,737; Aug. 17, 1926.

As illustrated above, this consists of a pair of combs pivotally connected together at one end and formed with inter-engaging hooks at their opposite ends, each of the combs being curved in the direction of their length and further provided with inter-fitting teeth. In use, the combs are opened as shown in the cut, the dampened hair is inserted in one of the combs, the device is then closed and left in place till the hair is dry. A "water-wave" curl should result. The comb may be made of celluloid, casein-solids, or of metal.

Straightening machine for celluloid, casein solids and hard rubber tubes and rods. Eugene Stich, German Patent 437,934, appl. Jan. 19, 1926.

The rods or tubes are slightly warmed to render them somewhat plastic and are then rolled under pressure between three rollers while being cooled, so that they finally emerge perfectly straight. The machine is easily handled, and fairly simple in construction.

Extruding Machine. Edward H. R. Barton, U. S. P. 1,604,799; Oct. 26, 1926.

While primarily intended for making clay units, or ceramic articles, the machine appears to have some utility for forming other plastics. It consists chiefly in the combination with a receiving hopper, feeding hopper feeding mechanism, etc., of a two-part die. This comprises a fixed outer portion or shell, somewhat analogous to a meat-chopper, and a rotatable center portion or hollow core, the object of which is to provide means for forming at one operation, a hollow block with one or more twisted or otherwise deformed partitions dividing the interior into crooked longitudinal chambers or passages.

Electrical Insulation from cellulose, oil soaps, acaroid resin, and gilsonite. D. M. Sutherland, Jr., U. S. P. 1,604,728; Oct. 26, 1926.

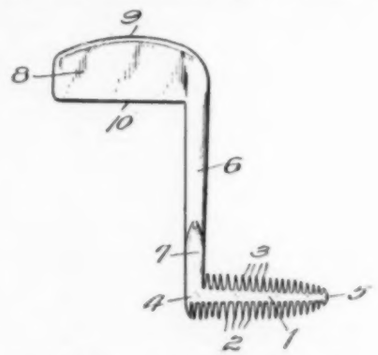
The composition consists substantially of 40 parts cellulose, 15 parts of a soap made either from chinawood oil or linseed oil, 2 parts acaroid resin and 43 parts of gilsonite. Alum is also added to precipitate an insoluble aluminum soap upon the cellulose fibers. The product is molded under heat and pressure, similar to shellac compositions. It is said to possess high dielectric properties, good machining qualities and a smooth even surface which is non-absorbent and water repelling.

Recovery of volatile organic solids, such as camphor. J. H. Bregeat, assignor to Bregeat Corporation of America; Wilmington, Del. U. S. P. 1,613,219; Jan. 4, 1927.

This invention deals with the recovery of such heavy liquid or solid organic materials as naphthalene or camphor from gases carrying the same by entrainment. In the Bregeat method of solvent recovery, the gases containing the materials to be removed are scrubbed with an absorbent oil comprising phenol or cresylic acid or both. The gases from a celluloid plant contain camphor and volatile solvents, and these solvents can be stripped from the phenolic absorbent by distillation, but the absorbent will gradually pick up so much camphor that its viscosity will be unduly increased. It is then treated with sodium hydroxide to precipitate the camphor, which is recovered, and the phenols which by this treatment are converted into water-soluble phenolates are again regenerated for further use as absorbents by treating the solution from which the camphor has been removed, as by filtration, with carbon dioxide, forming sodium carbonate and free phenol.

Apparatus for making striated plastic rods and tubes in imitation of ivory. Eugen Stich, German Patent 437,935, appl. June 12, 1925.

When extruding the plastic masses, use is made of two sieves having holes of the same cross-section, and spaced apart a definite distance. In addition to these holes, the upper sieve also has a smaller number of larger holes which, however, are not duplicated in the lower sieve, so that striations in imitation of ivory result in the extruded rod or tube.



"Side-burn" Comb. Vallie C. Law, U. S. P. 1,609,558; Dec. 7, 1926.

A comb especially designed to make easy the cutting of the hair on the side of a man's head, the so-called "side-burns", is made of hard rubber, bone or other plastic composition and has a thin comb body having its upper and lower edges provided with comb teeth which are shorter at the outer end of the body and becoming ing gradually longer at the inner and of the comb-body, an arm directed from the inner end of the comb in the direction of the upper and a substantially flat handle directed from the arm in a direction opposite to the direction of the comb, as shown in the above illustration.

Cellulose ester composition; use of bibenzyl as a cellulose nitrate plasticizer. Joseph G. Davidson, assignor to Carbide and Carbon Chemicals Corp. U. S. P. 1,617,237; Feb. 8, 1927.

Pyroxylin plastics are made according to the general formula of 100 parts cellulose nitrate, 10-20 parts of "medium boiler", and 10 to 30 parts camphor. The "medium boiler" refers to a mixture of butyl and amyl acetates. The gist of the invention lies in the use of bibenzyl as a substitute for the camphor. Bibenzyl is a white solid, melting at 51.8°C, and boiling at 248°C, having the formula $C_6H_5.CH_2.CH_2.C_6H_5$. While bibenzyl is not itself a particularly good solvent, it appears to have latent solvent power like camphor, and is superior to the latter on account of its freedom from odor, and lower cost.

Plastic phenol resins. More data on Karbolite. G. S. Petroff, Kunststoffe, 1927, 17, 65.

Further data on the chemical properties of the Russian phenol resin "Karbolite"; action of sodium hydroxide on the same; action of iodine, alcohol-benzene mixtures, and sulfuric acid. Some data is also given on the behavior of some (unidentified) American phenol resins. Some experiments on the resistance of molded Karbolite against nitric acid, sodium hydroxide and water are described also.

Preparing acylated cellulose ethers, such as diethyl cellulose formate, acetate or propionate. W. H. Glover, and E. Van Weyenbergh, assignor to Courtaulds, Ltd., London, England. U. S. P. 1,613,451; Jan. 4, 1927.

It has been found that cellulose diethyl ether can be converted into a compound corresponding to diethyl cellulose formate, acetate or propionate, by acylating the cellulose ether. For example, a cellulose ethyl ether containing 26.3% of the ethyl radical (C_2H_5), and which is soluble in cold water, is treated with glacial acetic acid at from 70 to 90 degrees centigrade. The ether goes completely into solution and the resulting product is precipitated by any suitable means, washed and dried. It is insoluble in cold water, but readily soluble in acetic acid, pyridine, benzene, alcohol, methyl acetate or dichloroethylene the solutions being perfectly clear. These acylated cellulose ethers are suitable for making threads or artificial filaments and for plastic materials, having properties somewhat analogous to other cellulose products as the esters.

Right-angled comb for barbers. H. E. Scott, Los Angeles, Cal. U. S. P. 1,615,408; Jan. 25, 1927.

This comb, which may be made from any suitable plastic material, is bent at right angles, or perhaps can be better described as consisting of two combs, with the teeth at the outside of the right angle. The claims call for a toilet or barber's comb, consisting of two combs rigidly attached together at one longitudinal end of each, forming an angle between them substantially less than 180°. The long end of the comb is held in the hand and placed over the patron's ear, while the shorter part is used to guide the scissors in trimming hair about the ears.

Method and apparatus for preparing plastic (hard-rubber) stock for making battery jars. Charles W. Leguillon, assignor to B. F. Goodrich Company, U. S. P. 1,619,079, March 1, 1927.

The invention covers machinery for, and method of making hard-rubber compound for making battery jars. As the invention can only be understood by a careful study of the five sheets of drawings and nine pages of specification and claims, it can only be said that the machine sheets the stock and has provisions for cooling it.

The Story of Colasta

(*Continued from page 209*)

strength of the rubber-like body.

The rubber-like body at this stage was very much like printer's rolls from glue, but could not be dissolved in solvents and was not capable of being hydraulically molded, but was self-molding like castings.

Stoppers, mats, tiles and tire fillers were more or less practically produced, but sheet and hard rubber and solutions could not be produced. The work with hexamethylenetetramine naturally suggested trioxy-methylene and similar results were obtained.

New Ideas

The next idea was to utilize the commercial 40% formaldehyde solution. The first experiment was to add formaldehyde solution to the regular mixture after the materials were properly mixed and just before the gel formed, that is, after the rubber reaction is well under way. Reaction took place and the resultant material was very much like wet gluten from the Martins starch process. As no attempts had been made to neutralize the uncombined acid of the sulphonate, the mass was taken to rubber washing rolls at a gutta percha plant and washed like rubber. Attempts to dry the mass showed that the colloidally entrapped water would not dry out naturally and recourse was had to a modified method. The trouble of handling, mixing, washing and drying the glutinous mass was due to its consistency, hence it was obvious that the colloidal material must be more dispersed at the begining of the process so that the final matter would be more liquid. Also up to this time the ratio of sulphonate to oil had been based on the iodine value for completely saturating the unsaturated groups. Iodine value of 150 on molecular weight

of 800 would be 1200 iodine or about 9.4 atoms per molecule. Since sulphonate acts as two substituting atoms, 47 molecules of sulphonate are needed or 718 of pure phenol sulphonate, or ratio 8 to 7. As our sulphonate was not pure phenol, the final ratio was 14 to 10, as there was an excess of acidity.

Removing Salts

In order to obtain a workable fluidity at the end of the reaction the proportion of dispersing reagent was increased. The successful compounding of the material for varnishes and hard molding depends not only upon the exactness of chemical proportions but upon the physical and chemical condition and the purity of the final product. The end-product consists of a viscous colloidal dispersion in water and is contaminated with neutralizing salts usually sodium sulphate. If an excess of alkali is used sodium hydrogen sulphate is formed. Any uncombined sulphonate will also form the sodium salt which is soluble and deliquescent.

The importance of the removal of hydrated salts is obvious for dielectric work, for salts constitute conductors and by absorption of the atmospheric moisture or water in the solvents become ionized and hence become conductors. Free from salts and properly made, this synthetic gum was excellent in dielectric and mechanical properties and resistance to chemcal reagents.

Manufacturing

Colasta is formed in three stages: first an anhydrous or dry reaction, namely formation of the sulphonate; second, formation of the dispersed rubber-like compound; third, a water reaction, using formaldehyde to vulcanize the rubber-like mass and condense the dispersing medium. The reaction is not catalyzed by alkali. Alkali is used after the reaction is com-

pleted for neutralization purposes.

The development of the organization kept pace with the improvements in its products, rather slow at first and U. S. Patents 1,251,862 and 1,251,863 were granted Jan. 1, 1918. From then on, greater progress was made and we went through our baptism of hard knocks in meeting the requirements of the trade. The business was first incorporated as the Web Lox Fibre Mfg. Co. and located at Watertown, Mass., later as the Howlett & Curtis Co. located at Newton Lower Falls, Mass., when the products were trademarked and became known as "Colasta." We finally took the name of The Colasta Company, Inc., and in 1923 moved to Hoosick Falls, N. Y.

The company carries on a considerable volume of business with those engaged in the fabrication of various parts in which a high grade heat resisting compound is desirable and is at the present time planning on the necessary enlargement of plant and additional equipment to accommodate rapidly increasing business.

The spirit of the Company is exceedingly cooperative with its customers and no expense is spared in rendering service of every description.

Molded Mica

(*Concluded from page 205*)

commutators, temperatures as high as 300° to 360° C. may be reached, for instance, when commutators are immersed in molten tin during the "tinning" operation. Thus mica plates and cones used in commutator construction may be subjected to temperatures sufficiently high to cause the shellac to ooze out from the mica composition between the copper segments. At higher temperatures this escaped shellac when carbonized or decomposed may cause short circuits. When not actually carbonized partial decomposition of the shellac will yield decomposition products through

destructive distillations which are deposited upon the various parts of the commutator and which are not only conductive in themselves but attack the copper and form additional deleterious non-insulating substances. Even when the shellac does not escape, its softening will cause sliding of the mica plates when under pressure. In commutator construction, this displacement of the mica plates will leave the commutator bars loose. It has been attempted to overcome these difficulties by using a phenolic condensation product as a binder for composite mica articles but it was found this material would not adhere to mica with sufficient tenacity, nor bond mica plates together sufficiently well to form an adequately dense and strong insulation. Phenolic condensation products also carbonize rather readily.

Glyptal Resins

We have discovered that esters of polyhydric alcohols fulfill all of the exacting conditions requisite for binders in mica compositions both physical and electrical and adhere with such tenacity to mica that cemented mica articles formed thereby ring when struck as though made of steel while at the same time being sufficiently thermoplastic even when fully cured to yield somewhat at high temperatures so as to be moldable sufficiently to permit some shaping of the mica articles during assembly as parts of electric machinery, or other structures.

We prefer to use the reaction product of glycerine and phthalic anhydrid described in Callahan Patent 1,108,329 in the soluble, fusible condition characteristic of the first stage of the reaction. Conveniently the ester is applied as an acetone solution to the surface of the mica and is drawn in between the laps of the mica films by capillary force. In some cases we may build up the mica plates with dry mica flakes to the required thickness and introduce the binder solution between the laminæ by immers-

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ing the plates in the solution and thus depend entirely on the capillary force to distribute the binder.

In the manufacture of built-up mica articles as for example, commutator cones, a stack of sheet material is first made as above described. After evaporation of the acetone solvent this sheet material is heated in a press to a temperature of approximately 175° C. At this temperature reaction takes place in the glycerine ester, which if continued will result in the ester becoming hard, infusible and insoluble. As it is not desired that the ester assume the infusible state before the article of mica has been shaped, the heating is discontinued while the binder is still in an intermediate thermoplastic state.

Machining

In this condition the plate is subjected to machining operations to preform blanks or developed shapes of the mica articles which we may desire to make. These developed shapes are then formed and put into molds which have been heated to 250° C., and at once put in a press which presses the mica into its final form. The molds and mica compositions are then taken out of the press and placed in an oven maintained at about 300° C. for sufficient length of time to polymerize the binder. No hard and fast molding and polymerizing temperatures for preforming and for polymerizing can be given which will apply to all cases. However, the temperature range in general varies within 100° to 300° C., the lower temperatures of this range adapted for the preliminary curing and the higher temperatures for the final hardening operation. The molds are then taken out, again placed in a press and held under pressure until cooled off either by the natural loss of heat or by artificial cooling. In some cases articles not molded are subjected to a special heating treatment to cure same.

The resulting article is mechanically stronger than an article produced by the use of shellac as a binder, and there is no tendency for the mica plates to slip over each other when the composite mica is subjected to heat, nor will such parts as mica insulators and tubes collapse under heat as will occur with shellac-pasted articles.

Hardening

The binding or bonding material described is insoluble in water and mineral oil after it has been hardened by the proper treatment under heat and pressure and therefore the mica insulations produced with this material are resistant to both water and mineral oils.

The electric insulating properties are superior to shellac pasted mica. Articles, produced in accordance with our invention may be subjected to the high temperatures encountered in the manufacture and operation of electric apparatus without deterioration or decomposition of binder.

For example, in some cases it is desired to subject such electric apparatus to the temperature of molten tin. It has been found that mica articles made as above described may be held in a tin bath at a temperature of 300° C. or even higher for six to seven minutes without injury. At these high temperatures the glycerine resin or ester instead of becoming soft and letting go its hold upon the mica, tends to become even harder and stronger if it has not already been converted into the final, infusible stage.

In some cases the mixture of powdered mica and powdered resin may be compressed cold with or without a small quantity of solvent into the form of billets or slabs. These billets may be cut into blanks preparatory to pressing and finally pressed or molded at a temperature sufficiently high to soften the binder."

The second patent, No. 1,619,758, carries the general idea of the process still further, especially as to the steps required to polymerize the resin.

For example:

"When a chemical reaction occurs between a polyhydric alcohol such as a glycerine and a polybasic acid, such as a phthalic anhydride, a fusible, soluble resinous material is first formed which is converted by heating to a hard, horny infusible and insoluble material. The gradual conversion or curing of the resin from the fusible to the infusible state in accomplished by some evolution of gases and vapors, chiefly water vapor and uncombined phthalic anhydride. When a material of this class is used for the purpose of binding together flakes of mica, the vaporous by-products of the curing reaction cannot readily escape due to the impervious nature of mica.

Curing

Improved results can be obtained by carrying out the first part of the hardening reaction of polymerization of the resin under such conditions that the escape of the volatile by-products is facilitated. With this result in view, the first heat treatment of the composition to be molded, which in this case consists of mica coated with a resin binder of the glyptal class, is carried out in a vacuum, thereby not only eliminating whatever solvent remains in the glyptal but also causing the initial step of the curing of the resin to occur under conditions most favorable to the elimination of the volatile by-products. The further curing of the material at a higher temperature is carried out while an intermittent pressure is applied upon the material. The release of the pressure provides for the escape of gases.

Mica plates of the size and thickness heretofore used in the manufacture of composite mica articles are pasted together by known methods with a binder consisting of a solution of glyptal in acetone having a specific gravity of about 0.86. The built-up plates or sheets of mica thus produced are covered on both sides with dry mica to

(*Continued on page 232*)

Blowing Celluloid

(*Concluded from page 211*)

raw tubing is somewhat narrower in diameter than the finished article, it is readily placed between the two halves of the mold, which are then united and pressed together until the pins and holes match; whereupon the mold is clamped shut. The pressure is then applied slowly and evenly, so that the plastic can gradually expand and fill the cavities of the mold.

Economies

The enlarged portions of the tube will eventually form the outer end of the telephone receivers. Obviously the greater the number of parts which can be formed at one time, the more economical this method of molding becomes. After the plastic has completely taken the shape of the mold, the latter is cooled and then opened. The single serpentine-formed tube is then removed from the mold and cut into sections along the lines a-b and c-d in figure 1, forming pieces which have the shape of fig. 2. This cutting is done with a fine-toothed circular saw, properly supported, so that the edges will be smooth and even. The individual parts having the shape shown in fig. 2 are then further divided into two parts by sawing along the lines e-f in fig. 2, thus forming two separate receivers or transmitters. These are of the European or as they are commonly known in America of the "French" type.

The receiver pieces thus formed are of course in their crude form, and require further pressing and drawing to give them their final form. This is done by again heating the plastic by means of hot water and then drawing the material in a manner quite similar to that already described in the March issue of *Plastics* (p. 103)

Although the two halves of the mold are made to fit snugly, a fine seam-like line will nevertheless show where the two halves of the mold joined, and this seam must be removed by tumbling the objects in a

tumbling-barrel, usually together with some other objects of a different contour. This tumbling barrel, besides containing the objects, also is charged with a certain amount of ground pumice. After tumbling for a few hours all the edges of the articles will be smooth and even, and the same will have acquired a high polish.

The Johns Patent

(*Continued from page 215*)

when cooling, to form a white corny mass.

The acetylcarbamid cited in Example 4, can be replaced by benzoylcarbamid.

The different products as described many be used, according to their special properties, as a glue, lacquer, impregnating material or as a substitute for rubber, ebonite, celluloid, corn or for other industrial purposes.

What I claim and desire to secure by Letters Patent of the United States is:

1. The process of manufacturing condensation products capable of technical utilization which comprises reacting with an aliphatic aldehyde upon substances containing carbonic acid amids, in a highly heated state, without adding any condensating medium.

2. The process of manufacturing condensation products capable of technical utilization which comprises reacting with formic aldehyde upon carbamid at the temperature of distillation, without adding any condensing medium.

3 The process of manufacturing condensation products capable of technical utilization which comprises reacting with formic aldehyde upon thiocarbamid in a heated state, without adding any condensing medium.

4 The process of manufacturing condensation products capable of technical utilization which comprises reacting with formic aldehyde upon acidulated carbamid in a heated state without adding any condensing medium.

5. The process of manufacturing condensation products capable of technical utilization which comprises reacting with formic aldehyde upon acidulated thiocarbamic in a heated state, without adding any condensing medium.

6. The process of manufacturing condensation products capable of technical utilization which comprises reacting with an aqueous solution of formic aldehyde upon substances containing carbonic acid amid, the components being present in a ratio of about 5 parts to 1 part, and heating the fluid during a comparatively short period.

7. The new product obtained by reacting with an aqueous solution of formic aldehyde upon substances containing carbonic acid amid, the components being present in a ratio of about 5 parts to 1 part, and heating

Accessories
For Toilet Articles

WANTED

CHEMICAL ENGINEER—Whose experience in the field of molded plastics is coupled with sufficient vision to permit him to see the possibilities of a considerable extension of the applications of molded plastics to our manufacturers. Our concern is located in Chicago and is large enough to offer excellent opportunities for advancement. Your first letter should detail your education and experience. Box 91, Western Electric Co., Hawthorne Works, Chicago, Ill., A. T. Barker.

FIRST CLASS MAN to estimate production and design molds for molded plastics. Fine opportunity for capable man. Location in vicinity of Cleveland, Ohio. Box 78, PLASTICS, 471 4th Ave., N. Y. C.

FOR SALE

FOR SALE—Machinery. Complete equipment for a molding plant: Accumulator, Mixers, Pumps, Air Tank, Rolls and Blankers, Hydraulic Presses, Motors. All in perfect condition and ready for efficient use. Address, Box 86, PLASTICS.

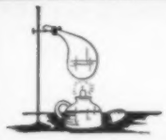
COMPLETE HYDRAULIC outfit for sale, reasonable; discontinuing line. Large mixing roll 30"x10"; blanking roll 6"x62"; air pump; hydraulic pump; accumulator, air tank; eight presses; rams 7½" to 10"; also steam tables, pipes and plastic material. Box 74, PLASTICS, 471 4th Ave., N. Y. C.

the fluid only a comparatively short time, which product is a glue-like mass, leaving, when died, a colorless sheet transparent like glass and insoluble in all inert solvents, and whichis applicable for sticking objects of any material, preferably with smooth surfaces, as well as for lacquering, varnishing or impregnating purposes.

8. The process of manufacturing condensation products capable of technical utilization which comprises reacting with an aqueous solution of formic aldehyde upon substances containing carbonic acid amid, the components being present in a ratio of not to exceed 6 parts to 1 part, and heating the mass until about half the reacting liquid is removed.

9. The process of manufacturing condensation products capable of technical utilization which comprises reacting with an aqueous solution of formic aldehyde upon substances containing carbonic acid amid, the components being present in a ratio of not to exceed 6 parts to 1 part, heating the mass until about half the reacting liquid is removed, and submitting the resultant product to a hardening process, preferably by heating it for some time at a temperature of about 80 degrees. centrigrade.

10. The new product obtained by reacting with an aqueous solution of formic aldehyde upon substances containing carbonic acid amid, the components being present in a ratio of not to exceed 6 parts to 1 part, and heating until about half the reacting liquid is removed, which product, still in a heated state, is fluid, but, when cooled, forms a tensile and elastic material, insoluble in all inert solvents, and applicable as a substitute for india rubber or, after being subjected to a hardening process, for ebonite, corn, celluloid and the like.



Materials
for the Plastics Industries

Essential Books

Plastics and Molded Electrical Insulation.

Emile Hemming. 313 pages. Illustrated. $6.00.

Very special care has been taken in the preparation of the chapter on molded insulation. Contains hundreds of references to plastic and composition products and their utilization in industry.

Casein and Its Industrial Applications.

Edwin Sutermeister. 296 pp. Price $5.00. Illustrated. 1927.

Eleven authorities, many of them specialists in this field, have contributed to this volume. "Casein Plastics" is from the pen of Dr. Geo. H. Brother.

The Chemistry of the Natural and Synthetic Resins.

T. Hedley Barry, Alan A. Drummond and R. S. Morrell. 196 pp. Price $5.00. 1926.

The work of three English chemists, who are recognized authorities on this subject, one of vital interest to the Plastics Industries.

Celluloid.

Its raw material, manufacture, properties and uses.

Dr. Fr. Bockmann. 188 pages. 69 illustrations. $3.50.

In this book, the raw product, cellulose and its properties are thoroughly described. Other raw materials and methods of rendering them more plastic also receive attention.

Pyroxylin Enamels and Lacquers.

Samuel P. Wilson. 213 pages. Illustrated. $3.00.

An authoritative work dealing with the materials and manufacture of pyroxylin solutions and with their application in the industry.

Synthetic Resins and their Plastics.

Carleton Ellis. 514 pages, illustrated. $8.00.

The book will serve as a guide and prove a stimulus to the numerous investigators and practitioners in the field of artificial resins. The section on plastic molding is an especially valuable feature.

Any of the above can be obtained by writing to

Book Department
PLASTICS
471 4th Ave., New York

Molded Mica Commutators

(*Continued from page 226*)

prevent sticking to the supports and are placed in an evacuated oven heated to a temperature of 110°C. where the mass is allowed to remain for a length of time varying with conditions from about 30 minutes to about two hours. During this preliminary heating step the acetone solution is thoroughly removed and, as already explained above, some polymerization of the resin occurs. The plates are then placed between cushions in a hydraulic press and after the temperature has become equalized by turning on the steam used for heating the press for about fifteen minutes, a pressure is exerted upon the mica of about 500 to 1,000 pounds per square inch of surface of the mica. The pressure of the steam in the heating coils of the press being maintained within the limits of about 80 to 100 pounds which corresponds to a temperature of about 160 to 170° centigrade. The hydraulic pressure should be released several times during the first five to ten minutes to allow the escape of volatile ingredients in the sheets. The escape of vapors is so vigorous that the hiss of escaping gas can be heard when the pressure is released. When after about ten minutes it appears that no more vapors are being given off, full pressure of about 1,000 pounds per square inch is applied to the mica sheets continuously for about 45 minutes.

Final Operations

The sheets thus produced are milled to equalize the thickness and thereafter the sheets are cut or sawed to produce developed shapes which can be later molded into cones or other desired articles.

After the developed shapes have been preformed they are placed in a mold, heated to approximately 250° centigrade and pressure is applied to give the articles the desired form. During this molding treatment of 250° centigrade which is continued for about ten to fifteen minutes the resin is carried very close to the final infusible state but the resin, even at the end of this time, is still capable when heated of yielding somewhat without actual fusion. This property of the resin of slightly softening at high temperature instead of remaining in a hard, brittle state is of particular advantage in the assembly of mica cones in commutators as it is impracticable to mechanically form the metal and mica parts of the commutator to exact dimensions. Hence when the cones are assembled with the other parts of the commutator and heated to a temperature of about 150 to 175° centigrade under pressure the binder will yield sufficiently to cause the mica to assume a snug mechanical fit with repect to the adjoining metal parts without cracking.

Buttons

(*Continued from page 210*)

Italy and Bohemia. In Italy the greatest progress was made, especially in the production of the cheaper grades, and only a few of the largest American ivory-nut button concerns can compare their output with that of the Italian producers.

As the product became more popular the price of the raw material, vegetable ivory, became higher, but this did not adversely affect the rapidly growing business in this commodity, which at present occupies an enviable position in world trade.

The closing chapters of this story will appear in our June issue.

"The Use of Asbestos in Plastics"

in

the next issue.

MOLDED PRODUCTS

Devoted to the purchase, further use and merchandising of all manner of molded parts

Vol. 1 MAY, 1927 No. 1

How to Order Molded Products

A time- and money-saving scheme that the buyer will find of practical value

By V. C. Rockhill

MR. BUYER has been approached by a Department Head who states that he has decided to use an item of Molded Composition which heretofore he has specified should be of turned wood. Mr. D. Head has found that wood is affected by atmospheric conditions, shrinks or warps, and furthermore does not always come to him uniform in dimension; and he knows such trouble will be overcome once and for all if he has the item in question molded of Plastic Composition. So. Mr. D. Head requests Mr. Buyer to go forth and get prices: further specifying that he would like item molded of a neutral brown, wood color, if possible.

About the same time Mr. B. is told by Mr. Engineer that he has decided that he can save money by having an item molded from Plastic Material with metal inserts molded therein, in place of a piece which he has always previously stamped from thin metal. And Mr. Engineer requests that prices be obtained for him to *his* new specifications.

The Buyer's Problem

Mr. Buyer is in somewhat of a quandary: he has purchased countless kinds of goods for different purposes but his knowledge of Molded Compositions is very limited.

Mr. Rockhill, consulting editor, has had many years experience in the molded products' field, both on the manufacturing and merchandising sides.

Inquiry, though, reveals to him trade papers which cheerfully supply him with a list of Molders of Composition Goods. A short line brings a salesman from each of several responsible firms.

One man stoutly maintains that only "synthetic materials" will serve Mr. Buyer's purpose. Another proclaims that "shellac molded" compounds are his (Mr. Buyer's) only salvation. A third talks glibly of "cold molded" compounds as just the thing, until Mr. Buyer is frankly bewildered as to what he should order.

Molding Compounds Compared

Mr. Buyer soon learns the comparative properties of Molding Compounds. He is instructed in the comparative virtues of "cold molded" and "hot molded" products; their relative insulating powers, strength, flexibility, color range, accuracy in molding and other properties are discussed at great length. But if Mr. Buyer will specify just what results he desires to obtain, Mr. Molder will be in a position better to supply a Molded Product to meet Mr. Buyer's requirements.

To facilitate quotations and save delay or a possible misunterstanding,buyers should always promptly answer the questions indicated later, these being substantially those in a questionnaire actually used by a firm of custom molders. They are important and have considerable bearing on the price of molded products.

(*Continued on next page*)

Questions the Buyer Should Answer

1. What quantity is to be purchased at a time, and how many of each piece (if there be more than one to quote on) If two or more pieces belong to a set, and will always be bought together, the mold can then be constructed so that it will produce the several pieces simultaneously, thus saving the expense of a separate mold for each piece.

2. What special qualities are required? The purpose for which the product is to be used should be stated. Cheerful cooperation will be given and the quality of molded material suggested which, in the opinion of the molder, will suit the purpose best.

A. Are high heat resisting qualities required and to what degree of heat?

B. Is high polish or finish required, and where?

3. How much draft (taper) is allowed to be added or to be taken away from the article inside or outside?

4. Is the article to fit snugly into some receptacle or device, or are the outside measurements arbitrary?

5. Is the entire order to be shipped as soon as goods are ready, or are shipments to be made periodically, and in what quantities?

6. If metal inserts are to be molded in, will the buyer furnish those inserts uniform and accurate in size and measurements? (This is very essential, because the steel mold cannot be altered to suit variations of metal inserts.)

7. What quantity of goods may be required annually? This information is requested because molds are designed and constructed with a capacity to produce quantities required as economically as possible. Yearly requirements will have a bearing on the price quoted.

It should be remembered that the reading and studying of a mechanical drawing or pattern, planning the construction of the necessary steel mold, estimating and compiling a quotation, require expert knowledge, and the time of a mechanical engineer and draughtsman, all of which represent a cash value.

A buyer should therefore not request from a molder too may possible variations from a single specification. Cooperation with the molder will ensure a lower price and a better product.

Promoting Molded Products Through Novel Exhibition

A REFRESHINGLY novel and picturesque sales promotion campaign is being conducted by Bakelite Corporation. A traveling exhibition, aptly described as a "Caravan of Ideas" is now re-emphasizing the manifold uses of the versatile phenol resin products made by this organization.

As an indication of the broad scope of this unique display, more than 2,000 separate items are on view, many of them very valuable, an array of products from 200 manufacturers.

Harry Carlson, the Corporation's mid-western manager, is in charge of the "Caravan." He has the assistance of W. B. Hoey and Preston A. Scott.

Attempts are being made to realize the educational possibilities of the collection by stressing the important part played by these molded and laminated products in various phases of those services so essential to our daily life. Visitors to the exhibition, who have been both numerous and genuinely interested, have seen for themselves the function of these products in home building, theatre illumination, subway operation and and the maintenance of the telephone service.

At the time of going to press, some of the points on the Caravan's itinerary have been in Ohio, Columbus, Dayton and Cleveland; in Michigan, Ann Arbor, Detroit and Grand Rapids; in Indiana, Fort Wayne, Indianapolis, and Anderson. Early in May, the Caravan is scheduled to visit Louisville, Ky., and Cincinnati, Ohio. Then, we are informed that the exhibition will trek eastward to Pennsylvania where Pittsburgh (May 10, 11) State College (May 13, 14) Bethlehem (May 16, 17) and Philadelphia (May 19, 20, 21) have been chosen as display points. The Caravan will next visit Baltimore (May 23, 24), and will come to rest for the summer season in Atlantic City. Usually, the "Bakelite Nomads" unlimber their wares in

(*Continued on page 244*)

Bakelite "Caravan" displayed at Dayton, O.

Primary Considerations in Design

Some pointers important for the buyer designing his own parts

FAMILIARITY with the elements of mold construction and design is a necessity for the man who wishes to embody his own ideas in parts ordered from the custom molder. Lack of this knowledge is often a source of much difficulty and misunderstanding. In what follows we shall point out certain features of correct design and also certain factors which serve only to complicate manufacturing operations without adding anything to their effectiveness. Attention to these points should assist materially in the production of molded parts which will be neat, efficient, and entail a minimum of cost.

A point to remember when designing a molded part, is that molding compositions have different properties from the materials they are displacing. The molding of an insulated switch- or fuse-box cover is a good case of this.

Stamped from metal or constructed of wood, a cover like that shown at A (Fig. 1), with thin walls and sharp corners, would present no difficulty, but molding it from a molding compound would not be easy. With its parallel sides, it would be a difficult job, without recourse to a mold of complex design, to exert the pressure necessary to impart the requisite strength at the points indicated.

Better designs would be B and C with thickened and decidedly tapered side walls, and corners well rounded. Where there is not much real flow during molding, as with cold molding compounds, D is the preferred design, but is not essential, however, with hot molding and free flowing compositions such as phenol-aldehyde resins, shellac compounds and pyroxylin plastics.

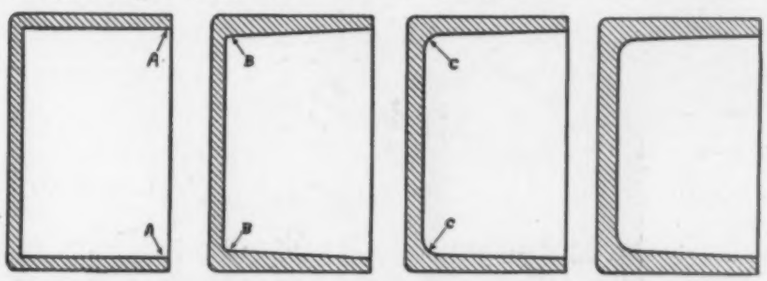


Fig. 1 represents section through fuse-box cover. A, incorrect design. B and C are better. The last, D, is most suitable for cold-molding.

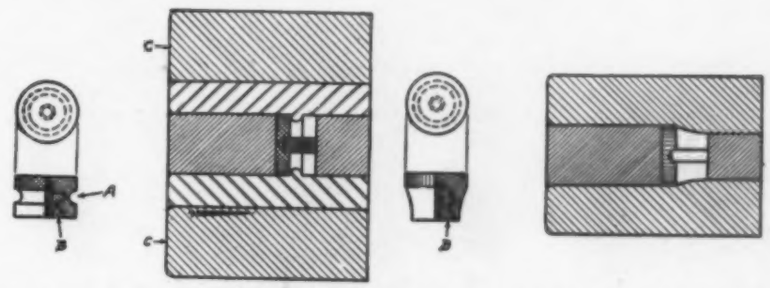


Fig. 2. Left, incorrect design for a knurled knob, necessitating the complex mold shown. Right, the correct design with simpler mold.

All digrams by courtesy of Chemical Catalog Co., from Hemmings "Plastics & Molded Electrical Insulation."

Insulated knurled knobs offer interesting instances of how proper design can facilitate molding, speed up production, and allow an altogether simpler mold to be used. The difficulties in molding the knob shown in Fig. 2A would be many, for the groove A and the braided knurling would make it essential to use a number of loose parts, which must first be removed from the box C of the mold in order to get the piece out. Also, fins or burrs would form at the junctions of these detachable parts, a source of increased cost and deterioration of appearance.

Another bad feature in this design, is the thread molded in the material above the metal insert B. Owing to a more or less pronounced shrinkage, there will be a discrepancy between the molded threads and those in the insert.

In the design recommended (Fig. 2B,) the side groove is eliminated and a straight form of knurling is used, thus simplifying the mold, making it an easy matter to push the molded pieces out of the mold and avoiding the formation of fins. The insert is lengthened so as to take the full length of the thread, and its end sloped so as to allow the composition to flow off and around it.

Figures 3A and B represent a molded base with several counterbored holes and a projecting piece A. Molded from the hot molding compositions, shellac, pyroxylin plastics, phenol-formaldehyde resins, or rubber, the design Figure 3A would offer no special difficulty. For a cold molding proposition, however, the modifications indicated in Figure 3B are advisable. In the first place the projecting piece should be given a slight draft

MOLDED PRODUCTS

Parts and pieces of every intricate description moulded of Phenolic, Bakelite or Laconite in the largest moulding plant in the world.

The Scranton Button Co.
Scranton, Pa.

Western Representative, Gordon D. Wilson
645 Washington Boul., Chicago, Ill.

Ohio Representative, J. E. Black & Co.
The 4900 Euclid Bldg., Cleveland, Ohio

New York Office, 50 Union Square
Arthur Wiseburn, Manager

and its junction with the base should be rounded as shown. Then again, holes should not be too near one another nor the edges of the base, and when counterbores are necessary each pair of holes as at C should be given a single elongated counterbore cut away as shown. The diameter of holes should be as large as possible so that the pins which form them may be of sturdy construction, while counterbores should be tapered for the reasons already mentioned.

The design and position of metal inserts in the molded part should be so arranged that they can be firmly held and supported without bending or distortion during molding.

In the following sketches certain considerations to be borne in mind in the planning of molded parts are emphasized more or less diagrammatically by contrasting the correct and incorrect design from the molders' and users' viewpoints.

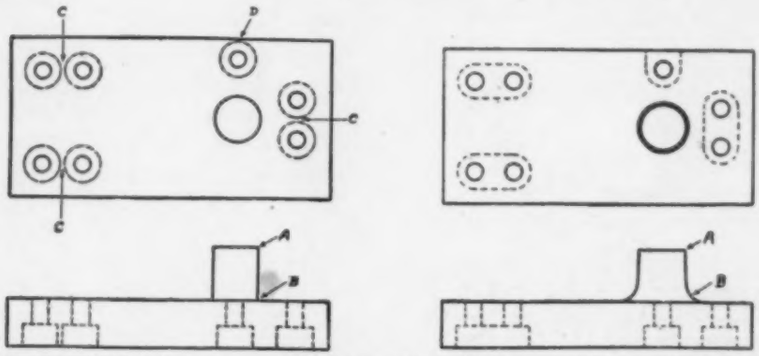
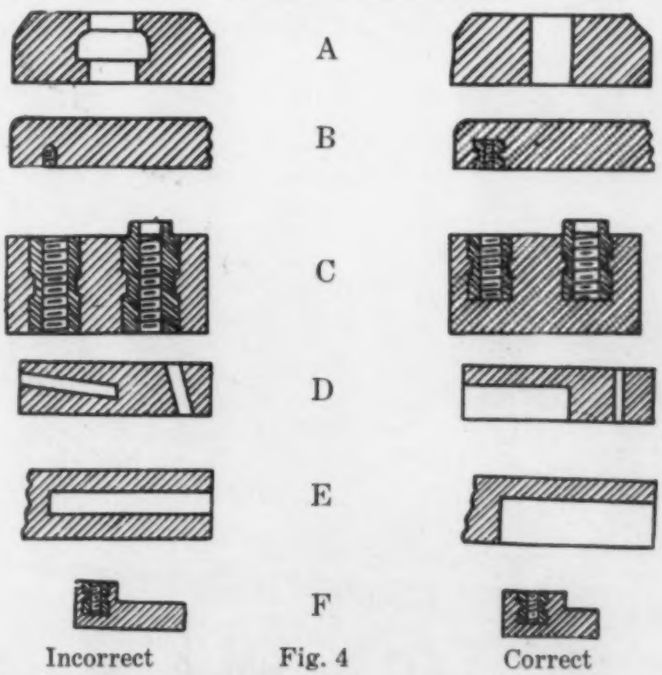


Fig. 3A (left) design unsuitable for cold-molded composition. 3B (right) properly designed base.



Incorrect — Fig. 4 — Correct

A. Pin not removable from incorrect design
B. Metal insert would not hold
C. Design on the right would give a much stronger part
D. Mold would have to be very complicated in order to free the part on the left from the mold
E. Same considerations as in D
F. Walls too thin in the design on the left

Plastics Replaces China

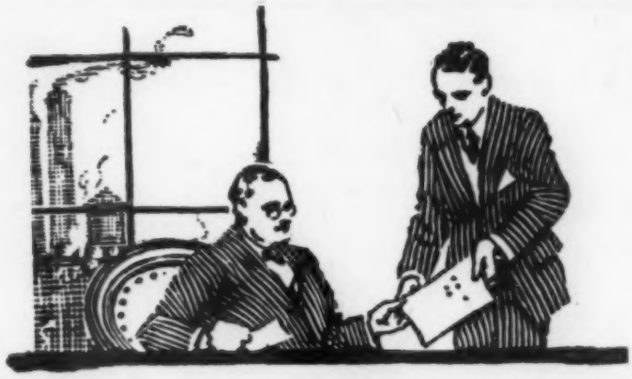
IN the "Editorial Impressions" for February, the Editor indulged in a series of fanciful flights into the future of Plastic Materials under the title "We Believe in Dreams." Now comes news from England of a partial vindication of these prophecies — table-ware made of a plastic composition.

At the recent British Industries Fair, there was on view, in the section devoted to pottery, an interesting display of table-ware, presumably made of a synthetic composition. Information gleaned so far is that like china-ware, the pieces are translucent, and come in black or a wide range of colors with a variety of marbled, alabaster and self-hued effects.

Fairly Non-Fragile

Although no claim is made as to unbreakability, the new ware is much superior in strength to glass and china. For instance it is stated that pieces may be dropped to the floor without breaking or even cracking, and that hot water will

(*Continued on page 243*)



Who Gains By Price Cutting?

No. 1. Adventures of Tom Tompkins, Salesman for the Super Mold Corporation.

THE salesman sat at the side of the old battered desk while a look of mingled expectation and apprehension spread over his face. Nervously he drummed on his chair. He wanted this order; in fact, his firm told him to get it 'no matter what you do.'

Slowly, carefully, punctiliously, as was his habit, John Dillon read the specifications and then the prices. He laid the estimate on his desk, then shook his head.

"Sorry, the price is too high," he curtly said.

With a shake, like a bull terrier coming out of cold water, Tompkins went to the attack.

"I don't see how that is possible, sir. My information from the office is that this molding job has been figured right down to the bone."

No Change

Which remarks led into a lengthy technical discussion where it was discovered that no other methods of manufacturing or change of specification on these parts could be permitted.

Tompkins thought a minute and decided on some drastic selling measures.

"Mr. Dillon, you have known the house and me for many years. We have discussed many a contract together and we have had many pleasant and mutually profitable business dealings. Now, I am going to ask you something that, off hand, you may not want to tell me. But if you do, it will be profitable to your company."

"It doesn't commit me to anything to listen," said the wily purchasing manager. "Go ahead and ask."

"Our house wants business. We want this order and I was sent out to get it. Tell me the lowest price my competitors have quoted and I believe I can quote under them on this particular job."

Quick as a flash came the answer, "I have been quoted 7⅜ cents on part A and 11½ cents on part B."

"Mr. Dillon," and the salesman was triumphant, "I'll quote 7 cents flat on A and 11 flat on B."

This man who had bought millions of dollars for his firm turned in his swivel chair and gazed long and steadfastly out of the window. So long did he look at what was obviously a dull view, that the man on the other side of the desk was fidgeting uneasily with impatience when he turned.

"Well, young man," hesitating, he beamed benignly, "I'm not going to take your offer," and at a protest from the salesman, "and I am going to tell you why."

"Let me say, in the first place, that I don't think it is good practice to undercut your competitor in just this way. But it is not on ethical grounds that I would turn down your bid. Candidly, I think it would be expensive and probably cost us more in the long run.

"For example, on this job, I don't believe there can be half a cent more per piece difference between your bid and your lowest competitor's. By that, I mean you can't make a profit at the price you've quoted.

The Product Wrong

If I give you this order, what happens. Your company can't mold parts at a loss, so on this job they either cut down on the quality of the material by putting in more filler or they jam the job through to save labor costs and the parts come out green. You know what that means in our business. Either case, our customers find something wrong with the product and look to us as the culprits.

Or if you don't do either of these things on this particular job and you lose money on it, as sure you will do, you lay for us. Sometime, when I am not looking, you sandbag me on the price to make up for this order which you took at a loss.

Don't shake your head. You people have been in business for over twenty years and somebody must make up for the losses incurred on the other fellow's job.

Another thing, I don't want to be known as a price shopper. When I ask you to quote, I want your best price first and candidly, after I have placed an order, I hate like Old Harry to feel that maybe after a little argument I might have gotten a

(*Continued on page 244*)

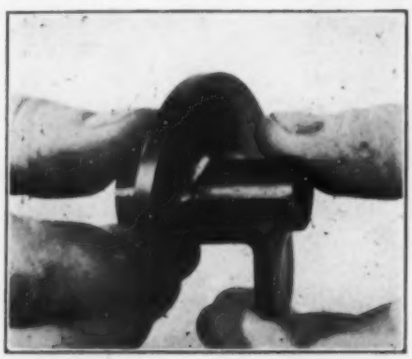
In future issues Tom Tompkins will have further adventures that are of significance to the buyer and seller of molded parts.

The Age of Molding!

A strongly marked trend towards the replacement of metal continues to influence modern industry

By A. Moses

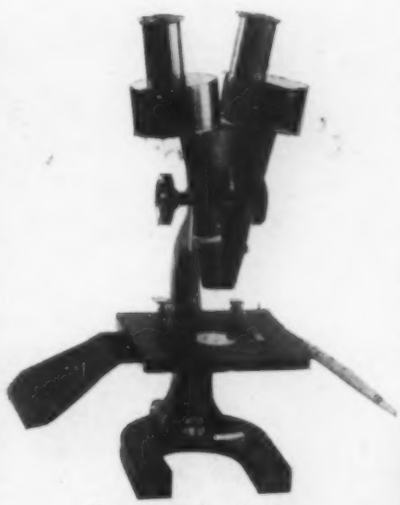
OUR present age is characterized by many tendencies which will adequately distinguish it from the past. Among these trends of the century, mass production is outstanding. The industrial world is engrossed with the supervision



Relay part formerly of aluminum, now molded in one operation.

extension of mass production—planning its progress, testing its power, studying its problems. In the age of mass production the increasing use of molded products is particularly significant. Molded products, especially those of the phenol resinoid type, have been a boon to large scale manufacture. Their service has been very general, nearly every major industrial field being benefited.

Materials and processes best adapted to meet the demands of mass production must gradually replace those which are less adequate. Considering for a moment the ever abundant use of metal, it is interesting to note that the list of instances in which metals are being replaced by non-metal molded products is already comprehensive and growing rapidly. In the field of wiring devices, for example, millions of wall switch



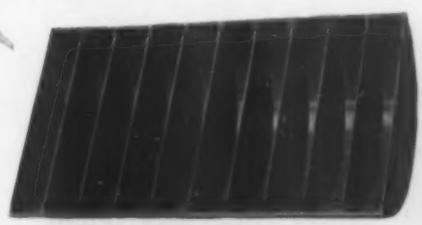
Spencer microscope.
(Photos, courtesy Bakelite Corporation.)

plates are already in use, and the process of metal replacement continues.

Disregarding for the moment the specific inherent properties which may make a molded part superior to metal, it will be found that from the standpoint of economical manufacture the molded product is frequently superior to its metal counterpart. Especially is this true of articles made from the phenol resinoid molding materials. Within only a few minutes they are converted into the completely finished molded unit.

Many Processes Eliminated

Such time consuming operations, as drilling, threading, lettering in relief, and polishing—to mention only a few—are dispensed with, since with a properly designed and adequately polished mold the effects of these operations are achieved during the molding process itself. Not only is rapidity of production attained, but also uniformity of output—another essential for successful quantity production. It might be argued that metal is stronger than molded composition. While conceding that such is the case in most instances, it will however be found that for a great range of applications, a well designed and suitably compounded molded product will have more than enough strength for the purpose in view. Molded parts having



Special battery jar—example of thin-walled molding.

comparatively thin walls are now being made with sufficiently sturdy construction to provide adequate strength.

Obviating the ever present tendency of unprotected metal surfaces to deteriorate through rusting or tarnishing, is the pleasing permanent finish of many of the molded products—a finish, moreover, which is obtained during the molding operation itself. Metals, although possessed of a fair range of inherent color beauty, are not adapted to the production of the variety of color effects which are so readily obtained in many plastics. In the case of the former, special processing, or coating with lacquers, varnishes, or enamels, is usually necessary, and even then the effect is by no means permanent. In the case of phenol resinoid molded products, the object comes from the mold with

(*Continued on page 245*)

China Replaced

(*Concluded from page 237*)

neither warp or crack them, while the products have the requisite attributes of ordinary earthenware and china. Thus the material is non-inflammable, light, tasteless, odorless and non-conducting. Its lightness makes it eminently suitable for picnic purposes and portability, and moreover, its non-conductivity offers a decided advantage over aluminum for handling hot liquids. A moderate temperature will not affect it, but the hot oven should be avoided.

Cleaning

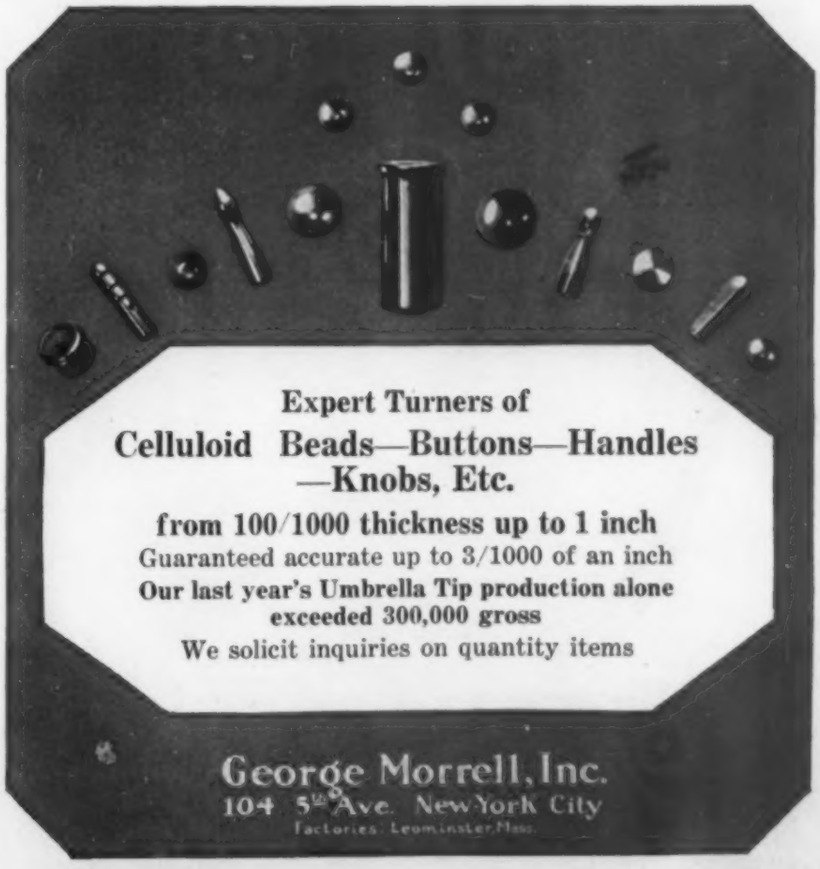
Cleaning requires care. The use of soap and hot water is advised, but, as in the case of aluminum articles, soda and strongly alkaline soap powders are best avoided, as otherwise, the surface will be roughened and the delicate coloring impaired. For bowls and other ornamental pieces, rubbing with furniture cream or liquid metal polish is also effective.

According to a list furnished by the makers, Messrs. Brookes & Adams Ltd., Birmingham, England, the prices would appear to be reasonable when compared with good quality chinaware. For instance, the cups and saucers depicted in our illustration sell for the equivalent of 70c a pair, the tray for about $3.00, the fruit stand for about $2.00 and the cream jug for for about 35c.

"Bandilasta" is the tableware's trade mark.

Fountain Pens 4000 Years Ago.

RECENT finds in an Egyptian tomb are regarded as proof that the scribes in those far-off days already felt the need for fountain pens. What was presumably the reservoir of this primitive pen consisted of a three-inch length of reed and this was cut away like a quill pen and mounted on a large piece of copper.



Price Cutting

(*Continued from page 239*)

better quotation.

No, sir! I want to do business on a fair and square basis. I want anybody that does business with us to always make a legitimate profit. I don't want to stick anyone and I don't want anybody to stick me. I desire everybody to feel they want to do business with us because we play fair and won't take advantage of them just because we are their customers.

Honestly, I believe the president of our company feels the same way I do and that this policy has saved us lots of money. I guess that's why he keeps me here."

The salesman stood up and stuck out his hand. As they shook, he said:

"Mr. Dillon, that's the finest and squarest policy I've heard in many months. Everything you have said is absolutely true, and believe me I know from experience. I am going right back and tell that to the house and if they are as smart as I think them to be, the next time we quote, our best and lowest price will be the only one sent you.

Yes, sir! that policy is going to save your company many dollars."

Novel Exhibition

(*Continued from page 234*)

the public rooms of some hotel or university.

Lack of space prevents a more complete enumeration of the very numerous items in the display, but the following is illustrative and suggestive:

Fishing reels, strap hangers, auto parts, football cleats, typewriter parts, radio parts, soda fountain parts, handles, surveyor's transits, adding machine parts.

Included among the two hundred or more manufacturers who have contributed their products are the following, taken haphazard:— General Electric Co., Kurz-Kasch, Norton Co., and Remy Electric Co.

Metal Replacement

(*Continued from page 241*)

a high polish, while some of the other plastics can be given a high polish by simple mechanical operations.

Non-inflammability is frequently cited as an important virtue of metal parts. Many molded products are well endowed with that property, however. Moreover, from so simple a factor as the relative weight the molded product usually scores over its metal competitors in this field.

Precision Molding

In the optical instrument field there are several interesting instances of the replacement of metal by molding material. In this industry where precision is a *sine-qua-non*, the accuracy and uniformity which is so characteristic of certain types of the molded products, has been given perhaps its highest recognition. Molded eyepiece tubes for binocular microscopes can be made in one operation complete with metal inserts for holding the prisms. The multiplicity of operations, formerly necessary with the use of metal, has been eliminated—one operation instead of many. When made of brass, the eyepiece for a surveyor's transit undergoes such operations as cutting-off, drilling, counter-boring, t h r e a d i n g, turning and buffing. Starting with molding material only one operation is necessary to produce the finished eyepiece.

In an early issue, other aspects of the tendency towards replacement of many metal parts by molded items will be discussed.

Next Issue!

"Distinguishing Molded Parts"

MOLDED PRODUCTS

Sportsmen Attention!

MOLDED composition materials already play an important part in the realm of sport. For golf club heads, phenol resin offers certain advantages over ash, aluminum and steel. Tees have been made from pyroxylin plastic and molded composition while a phenol resin tee-former has recently made its appearance to assist the golfer's play by enabling him to tee-off from a uniform tee. This device is marketed by the Royalty Sales Corp., Washington, D. C.

Another aid to the novitiate golfer is the plastic composition practise golf ball described in the February 1927 issue of PLASTICS, Page 58, which, when squarely struck, disintegrates into dust.

Apart from their significance, both historically and legally, plastic composition billiard balls have come to stay. Unlike ivory, they have no grained structure so that the balls made of casein ("milk balls"), pyroxylin plastics and phenol resinoid "play" better.

Bowling pins made of plastic composition have been a favored field for the inventor. A pin covered with pyroxylin plastic molded, was recently described in these pages (Jan. 1927, Page 32.)

Now comes the phenol resin Bakelite as an improvement on leather for football cleats. These cleats are said neither to wear down nor to soak up water, and are supplied in different lengths to suit the state of dampness of the field. The Golden Sporting Shoe Company, Brockton, Mass., are the makers.

MOLDED PRODUCTS

Screw Caps Next!

EVEN the humble metal screw top is no longer safe from displacement by caps made of phenol resin composition. This material lends itself well to mass production, as the finished polished cap can be made in one operation with screw thread and raised lettering molded in position. Not only is the polish permanent, but unlike metal, there is no danger of contamination of the tube contents owing to the remarkable inertness of the resinoid. Further the darkly rich color of the top in contrast with the rest of the tube adds considerably to the appearance of the whole, a not unimportant "selling point." Other similar applications should readily suggest themselves.

More Molded Handles

NUMBERING machines formerly provided with handles made of wood will be furnished in the future with similar parts made of phenol resin, according to an announcement of the of the Bates Manufacturing Co., Orange, N. J. Says this concern:

> "Bakelite for the knob handle of a numbering machine will wear longer than wood and has the added advantage of remaining polished and attractive indefinitely. The chances of cracking or breaking are diminished and the original beauty of the device is maintained indefinitely."

Novel Battery Boxes

THE use of cellulose acetate in place of hard rubber is making progress for the manufacture of storage battery cases, according to advices from our Trade Commissioner in Paris. Among the claims made are that cellulose acetate boxes are more resistant to break, and are very resistant to water, oil, gasoline and grease.

MOLDED PRODUCTS

Do you want to know?

THE extensive use of molded products is a comparatively new development. In fact, it is so new that it may not have occurred to you to use such a part in place of some article that might be made better and cheaper if molded. If you have thought of it, you probably have not investigated the method of use or are not equipped to find out the advantages or disadvantages of such inclusion in your product.

Here is the opportunity, and now is the time for you to find out all you want to know from an independent source.

PLASTICS & Molded Products maintains a complete research and investigating department which is at your service. There will be no charge for furnishing you as much information as possible in reply to the coupon below.

PLASTICS & Molded Products
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We may be interested in using a molded part for the following article: .....

Its purpose and use is .....

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It is now made as follows: .....

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Photo or cut of article is attached .....

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The Adamson Machine Co.
Terkelsen Machine Co.
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Southwark Foundry & Mach. Co.
Dunning & Boschert Press Co.
French Oil Mill Machinery Co.
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A. B. Farquhar
R. D. Wood Corp.

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American Machine & Foundry Co.

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Karolith Corp.

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Economy Ticket & Label Co.

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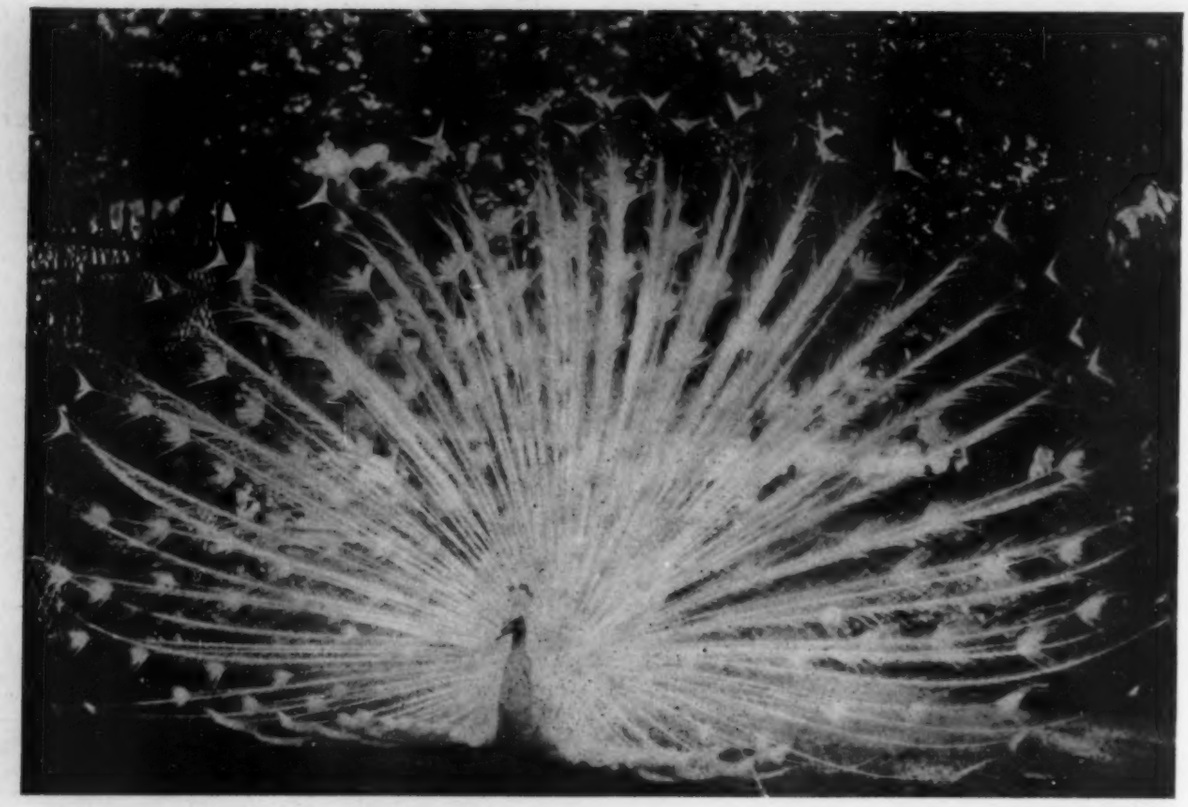
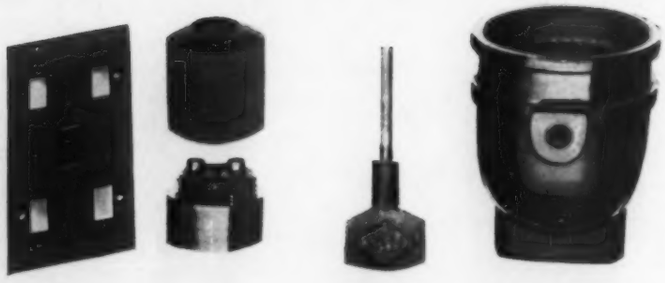


Beauty and Color

THE peacock, beautiful, scintillating, colorful, a creature of variegated hue best exemplifies the effects obtained with Colasta.

Molded parts of this material can be made in a matchless variety of colors that meet innumerable requirements, not only vivid, plain colors, but many mottle effects can be obtained with this versatile material.



Colasta

Write for further information.

THE COLASTA CO., Inc.

Hoosick Falls, N. Y.

Protected by U. S. Letters Patent 1251862 and 1251863

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RODS

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"SUPER PEARL AMERITH"

produces supreme beauty.

THE knowledge gained thru fifty-six years of manufacturing and fabricating experience is at your disposal. A trained technical staff will aid you in adapting to your needs sheets, rods and tubes of

"AMERITH-The Master Plastic"

or help develop new uses for its companion products

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